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ORIGINAL ARTICLES.

AN ANALYSIS OF ONE HUNDRED AND FORTY OPERATIONS ON THE KIDNEYS AND URETERS.[1]

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In response to the kind invitation of your president, I shall present for your consideration and discussion, this evening, a few facts gleaned from a brief and rather incomplete analysis of 140 operations on the kidneys and ureters. My reason for selecting this subject is twofold: first, my own personal interest in renal and ureteral work, and second, the fact that in looking over my renal histories I find a larger proportion of mistakes in diagnosis recorded than in any other group of operative cases. For this reason I have been in the habit, more or less frequently, of reviewing my case histories in an attempt to find data which would enable me to lessen the number of my diagnostic errors. Three years ago I made a careful analysis of all of my cases and presented a report of them to the Section on Surgery of the Academy of Medicine. Since that report I have had an opportunity of studying 56 additional cases, and it has occurred to me that a review of these and my previous cases might prove of interest.

Of the 140 cases, there were 48 nephrectomies with two deaths, 48 nephrotomies and exploratory operations with 9 deaths, 13 simple decapsulations with 2 deaths, 9 emergency operations on traumatic lesions with 1 death, 15 nephrorrhaphies and 9 operations on the lower ureter without mortality.

[1] Read at a meeting of the Section on Surgery of the New York Academy of Medicine, January 11, 1908.

The following are the pathological lesions found, many of the cases presenting two or more lesions: In the 48 nephrectomies there were 6 cases of new growth, 7 cases of tuberculosis, 18 cases of pyonephrosis, 17 cases of calculus, 3 cases of traumatic rupture, 8 cases of acute septic infarcts, 3 cases of hydronephrosis, 2 cases of ureterovaginal fistula following hysterectomy, 1 case of septic pyelonephritis, 1 case of severe hemorrhage following nephrotomy, and 1 case of necrosis of the organ from a twisted pedicle.

Of the 48 nephrotomies and exploratory incisions, there were 3 cases of newgrowth, 6 cases of pyonephrosis, 11 cases of calculus, 2 cases of tuberculosis, 14 cases of septic infarcts, 4 cases of intermittent hydronephrosis, 2 cases of pyelonephritis, 2 cases of polycystic kidney, 1 case of large cortical abscess, and in 5 instances the exploratory incision revealed no lesion. While decapsulation was frequently practised in acute septic and other conditions, in connection with other operative procedures, in 13 instances it was the only operation. Of the 13 simple decapsulations, in 5 patients the double operation was performed for chronic nephritis, in 1 instance single decapsulation was performed for a long-standing renal neuralgia of unknown origin, and in several others it was undertaken for the relief of subacute septic infarcts.

The 16 nephrorrhaphies were all for the relief of movable kidney. In 6 of these, positive signs of an intermittent hydronephrosis were obtained prior to operation. In all the others there were distinct renal symptoms, varying in severity from slight but frequently recurring discomfort to characteristic Dietl's crises.

Of the 9 operations on traumatic cases, 7 revealed evidences of injury to the kidney varying from slight capsular rupture to complete crushing. In two instances a rupture of one or more of the larger branches of the renal vein was present.

Of the 9 operations on the lower portion of the ureter, in 4 arrested calculi were found, in 2 the ureter was kinked by an inflammatory mass, in 1 there was an adherent calcified appendix epiploica of the sigmoid, giving rise to an *x*-ray shadow, while in 2 the ureter was found to be normal.

Fatal Cases. It may be instructive first to analyze the 14 fatal cases of the series. In my first report of 84 cases, 12, or 14.2 per cent., proved fatal, while in my last series of 56 cases only 2, or 3.7 per cent., died as a result of operation.

In the 48 nephrectomies there were 2 deaths. The first of these occurred in a middle-aged man upon whom nephrotomy was performed for the removal of multiple calculi of the pelvis. There was considerable laceration of the renal tissue in the removal of the four stones, giving rise to a severe hemorrhage, which was only controlled by generous gauze packing. Four hours later the hemorrhage recurred. I was summoned and performed a hasty nephrectomy on a moribund patient. Although the removal of the kidney

was accomplished without more than a trifling loss of blood, and although the patient received a large intravenous infusion of normal salt solution and was otherwise stimulated, he never rallied, and died at the end of four days from suppression of urine and œdema of the lungs. Autopsy revealed chronic left-sided pyelonephritis and several calculi that had not been revealed by the *x*-rays. While the case was an unfavorable one, had the nephrectomy been performed at the primary operation while the condition of the patient was still good, recovery might have taken place. The procedure followed was undoubtedly an error of judgment on my part.

The other death occurred in a feeble and profoundly prostrated girl, who had been suffering for weeks from pain, vomiting, and septic intoxication. She had a movable tuberculous kidney, which had become adherent in the pelvic cavity, and had acquired a mixed infection. The operation was an exceedingly difficult one, and was accompanied and followed by profound shock, which did not respond to active stimulating measures. I cannot blame myself for this fatality, as the difficulty in the operation consisted in exposing the kidney; it would scarcely have been less if only drainage had been employed, and it is exceedingly doubtful if simple drainage would have sufficiently relieved the grave toxemia to allow a secondary nephrectomy had she survived the primary operation.

Of the 8 deaths which occurred in the nephrotomy cases, I can severely blame my judgment in but one instance. This was the case of a man, aged seventy-one years, in poor general condition, who for four years had suffered symptoms suggesting stone in the right kidney. There were frequently recurring attacks of renal neuralgia, with the passage of dark colored urine. There was marked tenderness in the right costovertebral angle. Cystoscopy showed urine from both ureteral orifices. The urine at the time of examination did not contain blood. No *x*-ray examination was made. The kidney was explored by the lumbar route, its cortex incised, and no lesion found. Infection followed, and the patient succumbed five weeks later to general sepsis. There were 4 fatal cases of acute septic infarcts, which were treated by nephrotomy and drainage. These were among my earlier cases, when I believed the lesion to be bilateral. At present I am convinced all might have been saved by an early nephrectomy. They will be discussed more at length later in the paper. In a sixth case in which nephrotomy was performed for stricture of the upper ureter death resulted from pneumonia.

The seventh death in this series occurred in the case of a young woman, aged twenty-four years, who had suffered for years from left-sided renal tuberculosis. Several weeks before admission septic infection occurred and resulted in a mixed pyonephrosis. At operation the kidney was found distended with pus, the cortex being studded with innumerable tuberculous foci. The operation

consisted simply in incising and draining the pus cavity. She died four days later from uremia.

The eighth death of this series occurred in a profoundly septic woman with a perinephritic abscess, the result of a neglected unilateral blood infection (septic infarcts). The history of this case will be reported in detail later in the paper.

The ninth death in this series, and the only death which occurred from a simple exploratory incision, was in a case of huge inoperable malignant tumor of the right kidney. The patient was a man, aged fifty-one years, who had suffered from symptoms of renal growth for eight months and was markedly prostrated by repeated hemorrhages. On exposing the tumor by a large König incision, it was found to be highly vascular and its surface covered by large adherent veins. The pedicle was so short that it could not be safely ligated. The operation was therefore abandoned. The patient never rallied from the exploration, which was the immediate cause of death. In all probability he would have lived several weeks longer if he had not been subjected to operation.

The only death which occurred in my series of traumatic cases was that of a man who had received a heavy blow on the right side, resulting in a complete rupture of the kidney and a fracture of the liver with extensive intra- and extraperitoneal hemorrhage. At operation the abdomen was first opened and the liver hemorrhage checked. The renal region was next explored, but the condition of the patient would not permit further operative procedures other than gauze packing. He died in a few hours of shock and loss of blood.

The two deaths which occurred as a result of double decapsulations were both cases of advanced chronic nephritis. In both instances death resulted from an increase in the uremic symptoms. There was no local infection.

Decapsulation in Nephritis. While I have never seen a cure result from decapsulation in chronic afebrile nephritis, I have observed marked improvement in two instances. The first was that of a middle-aged man who was admitted to the City Hospital suffering from mild symptoms of uremia, probably accentuated by a recent alcoholic debauch. The urine contained a fairly large percentage of albumin with granular and hyaline casts. After double decapsulation the albumin diminished and the granular casts disappeared. His general condition improved greatly, and he was discharged in excellent condition. He was watched for several years by a member of my house staff, who made frequent examinations of the urine. He was able to continue his occupation as a worker in the city morgue, and only had a recurrence of his symptoms after indulgence in alcohol.

The second case was that of a boy, aged eight years. For four months he had suffered from headaches, œdema of the face and legs,

and ascites. He had been repeatedly tapped, and the legs had been incised for the œdema. The urine showed the signs of a diffuse nephritis. After double decapsulation all the symptoms improved rapidly. The œdema disappeared, the ascites diminished, the headaches cleared, and his general health improved. The change was so striking, occurred so promptly after the operation, and presented such a marked contrast to the progressive deterioration of health before operation while under medical treatment, that it convinced me that in this case at least the operation had been of decided benefit to the patient.

My experience with decapsulation in acute cases, particularly in cases of subacute septic infarcts, has convinced me that it is of great value. A rather striking example of an effect of this kind is the following: The case was that of a married woman, aged twenty-three years, who was admitted to the Roosevelt Hospital with a diagnosis of renal calculus. Seven weeks before admission she experienced a severe pain in the right loin, radiating to the groin and thigh. This pain continued for one to two hours and then subsided. Following the paroxysm of pain she had a severe chill, with fever and vomiting, which lasted for two days. During this period the temperature reached 103° F. Since the acute attack the patient had complained of more or less constant pain and discomfort in the region of the right kidney and ureter, with occasional attacks of a more acute nature.

On admission to the hospital she seemed weak and anemic. Her temperature was 100° F., pulse, 120; and the blood count showed 10,000 leukocytes, 56 per cent. polynuclears. Physical examination revealed tenderness in the right costovertebral angle, and along the course of the ureter to the pelvic brim. On cystoscopic examination the bladder appeared normal. There was, however, no efflux from the right ureteral orifice, but an abundant flow from the left. Both ureters were catheterized. From the left there was an abundant flow of normal urine; from the right only a few drops were obtained after forty-five minutes. *X*-ray examination was negative. From these findings a diagnosis of subacute infarcts was made, and an operation was advised.

Under ether anesthesia, the right kidney was explored by lumbar incision. The fatty capsule was somewhat adherent. The surface of the organ was studded with small, whitish areas which were moderately indurated. No calculus was felt. The fibrous capsule was stripped from the organ, the kidney replaced, and the wound sutured. There was a moderate febrile reaction following the operation, which subsided on the seventh day. The wound healed by primary union. All sutures were removed on the tenth day. Fourteen days after operation she was again cystoscoped and the ureters catheterized. From both catheters there was an abundant flow, 12 c.c. from the right and 15 c.c. from the left in twenty minutes.

Although the urine from the right side showed a very faint trace of albumin, its percentage of urea was higher than that from the left, showing that its function had been practically restored.

NEWGROWTHS. Twelve cases of newgrowth were encountered in this series. Of these, 3 were carcinomas, 2 hypernephromas, and 1 adenoma; 2 were cases of solitary cysts, 3 of polycystic kidney, and in one no accurate diagnosis could be made, although the history suggested a rapidly growing hypernephroma.

Of the cases of carcinoma, one developed in a man aged thirty-three years. The kidney was removed. The pathological diagnosis was adenocarcinoma involving one-half of the organ but not perforating the capsule. He is now well, seven years and eight months after operation.

The second case was one of epithelioma of the pelvis, which also contained a large branching stone. The growth had extended beyond the capsule and involved the renal vein. The patient was a feeble, elderly woman over sixty. She recovered from the nephrectomy, but died shortly after of general metastasis.

A third case occurred in a retired naval officer aged fifty-nine years. A small carcinomatous nodule was found in the upper half of the right kideny. He recovered from a nephrectomy and remained well for about a year, after which he gradually failed and died, probably of visceral metastasis.

Of the two cases of hypernephroma, one occurred in a woman aged forty-one years, with a history of left-sided pain and hematuria for eight years. On examination a large nodular tumor was felt in the left kidney region, which was freely movable and not tender to pressure. Nephrectomy was followed by prompt recovery.

The second occurred in a woman aged sixty-nine years, who also suffered from grave valvular disease of the heart. The tumor had evidently existed for a long period before characteristic symptoms appeared. Ten days before operation she experienced severe pain, chills, and fever. A large renal tumor was present, and was markedly tender to the touch. There were found also two hard glandular masses in the neck, but no sign of lymph-node involvement elsewhere in the body. At operation three pathological conditions were found—a large hypernephroma involving nearly one-half of the organ, a septic pyonephrosis, and a conical calculus plugging the ureter. She recovered from the operation, the wound healing kindly, and for several weeks was free from pain and discomfort. Later she developed signs of a rapidly progressive cachexia, and died about two months after the operation.

The case of adenoma occurred in a woman aged forty-six years, who for two years or more had suffered from attacks of left-sided abdominal pain, with dark colored urine. These attacks were repeated at frequent intervals, and were often accompanied by vomiting and fever. On palpation a moderate sized movable kidney

was found. An exploratory incision was made, and an oval, apparently encapsulated tumor was found on the anterior surface of the kidney. This was enucleated and the kidney decapsulated. The pathological report was adenoma. Two weeks later the kidney was removed, and she made an uninterrupted recovery.

Of the two solitary cysts, one was of moderate size, thin walled, translucent, growing from the anterior surface of the right kidney; the other was of enormous size, thick walled, and filled with pus, probably an echinococcus cyst, which had suppurated. In the former case the cyst was enucleated, in the latter the kidney was removed. Both patients made satisfactory recoveries.

Of the three cases of polycystic kidney, one was double and inoperable. The patient was sent to the hospital as a possible case of ectopic gestation. The history was that of a rapidly growing painful tumor following a sudden cessation of menstruation. The woman was obese, and only the lower portion of the right kidney tumor could be palpated in the inguinal region. Operation revealed two enormous polycystic kidneys, which were not disturbed.

The second was that of a rapidly developing tuberculosis of a moderate sized polycystic left kidney. Its removal was followed by prompt recovery. In the third case a polycystic right kidney was found to be the seat of multiple acute septic infarcts. The patient was sent to the hospital with a diagnosis of acute appendicitis. She recovered promptly after decapsulation.

The last of the new-growth cases was that of the fatal exploration on an inoperable malignant growth already referred to in the early part of this report.

Tuberculosis. Nine cases of primary tuberculosis of the kidney were operated upon. Of these, 4 were early cases, the lesions being multiple and small, and 5 were late, there being in addition a tuberculous or mixed pyonephrosis.

Two of these, one early and one late case, were operated upon by nephrotomy and drainage. Both of them occurred early in my experience, and both patients died within two weeks of the operation. The reason why these kidneys were not removed was that in one, the early case, I believed from the history that the condition was septic and bilateral. In the second, a late case, I believed that the condition of the patient would not warrant a nephrectomy. I am now convinced that my judgment was defective in both instances. Seven cases were subjected to nephrectomy, and of these, 6 recovered, and when last heard from 5 were in good or improving condition, 1 having died two years after operation from general tuberculosis.

Calculus. The group of calculus cases furnishes an interesting series. In my former report, being impressed with the number of errors which occurred in the diagnosis of stone, I made a careful analysis of 36 cases in which the histories led us strongly to suspect the

presence of a calculus in the kidney or ureter. In 21 cases, or 59 per cent., only did the operation confirm the diagnosis. With a view to finding out if possible the reason for this large percentage of error, I made a chart recording the presence or absence of all the chief symptoms or signs generally encountered in calculus cases, and compared the grouping of these symptoms in the two classes.

As a result of this study it was hoped that the errors during the last three years would have been less glaring, but on reviewing our records it is found that in only 52.6 per cent. of our recent cases of suspected calculus did the operation prove our diagnosis correct. The number of errors is discouraging, and it may not be a waste of time to apply the same analysis to the recent series of cases and by combining the two groups attempt to throw some additional light on the subject.

The number of cases which in their onset, early symptoms, and subsequent history led us to believe stone to be present in the kidney or ureter were 57. Of these, in 32 instances stone was found at operation, in 19 no stone was found, but some other definite lesion which furnished a reasonable cause for the existence of the symptoms, while in 6 no lesion was found.

Let us therefore consider for a moment: (1) The subjective symptom, pain; (2) the objective symptoms, as frequent and painful micturition, vomiting, fever, localized tenderness, and the presence of a renal tumor; (3) the results of urinary analysis with reference to hematuria and pyuria; (4) the results of *x*-ray examination; and (5) the results of cystoscopy and ureteral catheterization.

Pain is, perhaps, the most constant and characteristic symptom of renal stone. It was present in some form in 31 of the 32 cases in which stone was found at operation. Its absence was not recorded in a single instance, but the history is defective in 1 case. Regarding the character of the pain, it is somewhat difficult to classify the cases, as it frequently changed during the progress of the disease. I have therefore made four classes indicating the type most prominently present in each case: (1) Severe paroxysmal pain, radiating downward from the kidney along the course of the ureter, the typical renal colic; (2) mild paroxysmal pain, radiating less constantly downward; (3) severe constant pain; (4) mild constant pain or discomfort. Of the 32 cases in which stone was found, 19 had severe paroxysmal pain, or typical renal colic, 4 had mild paroxysmal pain, 2 had severe constant pain, 6 had only mild constant pain. In 3 of the 19 cases having severe paroxysmal pain, it began in the epigastric region, shifted later to the region of the kidney, and continued thereafter in that location.

Of the 6 cases complaining only of mild constant pain, 1 had an open sinus from a previous nephrotomy leading to a pelvis full of stones, and the seat of a purulent inflammation, 3 were profoundly septic, and 1 had a soft stone completely filling the pelvis.

The point of greatest intensity of the pain was not infrequently located somewhat below the kidney, in several instances at or near McBurney's point on the right side, or at a corresponding point on the left. This was particularly the case in a patient with a stone which frequently became impacted in the upper portion of the ureter and was found there at operation; also in another case in which a small stone was found in a calyx at the upper pole of the kidney. Both of these cases had been subjected to operation for the removal of the appendix. In a third patient, who also underwent the operation of appendectomy, the cause of the inguinal pain was found to be a stone arrested in the lower ureter near the bladder.

In 3 other cases of stone arrested in the lower ureter, the point of greatest pain and tenderness lay below McBurney's point, about one inch above the external abdominal ring. In 2 cases of stone in the lower ureter (both females) there had been a numbness at times of the labium on the side corresponding with the lesion. In 1 case of stone in the lower ureter, there was a constant pain near the umbilicus, with occasional attacks of acute paroxysmal pain in the kidney.

Of the 25 cases in which no stone was found at operation, 10 had severe paroxysmal pain, 1 mild paroxysmal pain, 8 severe constant pain, 3 mild constant pain, while in 3 the history is defective. Of the 10 cases with typical renal colic, 1 had an intermittent hydronephrosis from movable kidney, 1 a chronic interstitial nephritis, 4 had septic infarcts, 1 an adenoma, 1 a periureteral exudate, while 2 presented no discoverable lesions of the kidney or ureter. In addition to characteristic and unusually severe renal colic, these 2 patients also had vomiting and blood in the urine. The cystoscope showed in each instance an œdematous and everted ureteral meatus, into which a catheter could not be made to enter. The *x*-rays in 1 case showed a dimly defined shadow over the lower ureter, in the other no shadow in 3 exposures.

Of the other patients, 1 with mild paroxysmal pain had a perinephritic abscess. The *x*-rays in this case led us astray by showing a distinct though ill-defined shadow in the renal region (only one exposure), 3 patients with severe constant pain showed no lesion of the kidney, 4 had suppurative disease of the kidney, and 1 had a chronic diffuse nephritis with intermittent hematuria coming from the ureter corresponding with the painful and tender kidney.

One case with mild constant pain, which was located over the lower ureter, showed on *x*-ray examination a distinct shadow in the pelvis. Operation revealed the presence of a large calcareous body adherent to but outside the ureter, near the bladder; 2 others with mild constant pain over the ureter, and with *x*-ray shadows, proved negative on exploration.

Vomiting was found to be a very constant accompaniment of severe colic. Of the 32 cases in which stone was found, 12 had vomiting, 15 had no vomiting, and in 5 the history was defective. Of the

25 cases in which no stone was found, vomiting occurred in 13, was absent in 6, and unrecorded in 6 cases. That it is not a very reliable symptom of calculus will be appreciated when we observe that it occurred in a greater percentage of the cases in which no stone was found.

The combination of severe vomiting and violent epigastric pain is misleading, and in my experience has once led to an unnecessary laparotomy. Severe colic is less likely to be accompanied by vomiting when the stone is in the lower ureter than when the lesion is in the upper ureter or kidney.

Frequent or painful micturition, occasionally associated with severe tenesmus, was present in 20 of the 32 cases of stone; it was absent in 9 and unrecorded in 3. In the cases without stone it was present in 8, absent in 9, and unrecorded in 8 cases. Of 6 cases of stone in the ureter, this symptom was constantly present.

Fever is rarely a symptom of uncomplicated stone in the kidney or ureter, but is frequently present when infection is added. It was present in 13 cases, absent in 17, and unrecorded in 2. Of the 13 cases in which it was present, all had pyuria or other evidences of septic infection.

Mild and even moderately severe cases of calculus pyelitis often exhibit a normal temperature while the ureter remains patent, but show an immediate rise in temperature if for any reason the ureter becomes occluded. This occurred in 4 cases of my series, in 2 of which the stone became impacted in the upper part of the ureter, and in 2 others the stone was arrested low down in that canal, and temporary occlusion was probably caused by some change in its position.

Of the 25 cases in which no stone was found, fever was present in 9, absent in 9, and unrecorded in 7. In this group also fever was present only when infection was known to exist.

Tenderness was present in every case of stone in which the history was preserved; thus in 31 of the 32 cases its presence is recorded. In 26 cases it was present in the region of the kidney, best elicited by bimanual papation or by firm pressure in the costovertebral angle. In one instance the tenderness existed over the ureter, the stone being subsequently found in the kidney; in another the tenderness was chiefly over the kidney, the stone being found in the lower end of the ureter. In 3 cases of stone in the lower ureter, tenderness was most marked from one to two inches above the external abdominal ring, while in 1 it was at the brim of the pelvis.

Of the 24 cases in which no stone was found, 16 had renal tenderness, while in the remaining 8 the records do not mention it.

As tenderness is generally present when severe spontaneous pain is felt, and as in at least 6 cases of this series which showed no stone or inflammatory lesion marked tenderness existed, too much reliance must not be placed on this symptom.

Renal Tumor. In only 14 of the 32 stone cases could the kidney be palpated, while in 17 it could not be felt, 1 case being without a record. In 4 only of the negative cases was the kidney palpated, 1 of these being an intermittent hydronephrosis, and 1 a large pyonephrosis. In the remaining 21 this sign was either absent or unrecorded.

While the presence of an enlarged and tender renal tumor must be regarded as almost positive evidence of some lesion of that organ, the absence of this sign should not militate against the diagnosis of stone, as it is rarely encountered in uncomplicated cases of renal calculus.

Hematuria. While blood is probably present in the urine at some period in nearly every case of renal or ureteral stone, it is often in such small amount as to be detected only by the microscope; moreover it is often entirely absent at the time of a given examination. Of my 32 stone cases, 16 had blood in the urine, 14 had none, and in 2 the history is defective. Of the 16 cases in which blood was found, in 7 it colored the urine so that it was noticed by the patient, and in 9 it was found only by the microscope.

Of the 25 cases in whch no stone was found, 11 had hematuria, 9 had no blood, and in 5 it is not recorded. Of the 11 cases of hematuria in which stone was not found, in 9 the blood was seen only by the microscope; in 1 it was seen by the cystoscope, issuing in a long worm-like clot from the ureter; in the remaining case, in which the hemorrhage was abundant, the lesion proved to be chronic hemorrhagic nephritis. Of the 9 cases in which microscopic blood was found, 1 was an acute pyelonephritis, 1 a pyonephrosis and cortical abscess, 3 septic infarcts (2 acute and 1 chronic), 1 an adenoma, 1 a periureteral exudate, and 1 showed no lesion at operation, although there is much reason to suspect that in this, as well as in the case in which blood was seen by the cystoscope issuing from the ureter, a stone was present in the ureter and passed just before operation.

In calculus cases, one is apt to find traces of blood during or immediately after a paroxysm of colic. In one instance, after watching for several weeks a patient who complained of severe attacks of paroxysmal pain and vomiting, the pain being referred to an area about the size of a silver quarter, one inch to the inner side of McBurney's point, I was able to make a correct diagnosis by observing a few red blood cells in a specimen of urine passed immediately after a paroxysm. This led me to make a second exploration of the kidney (the first exploration having been performed by another surgeon several months before). At the second nephrotomy, a small calculus was found completely plugging the pelvic extremity of the ureter.

Pyuria. The presence of pus in the urine is dependent upon so many factors that it is of very little value in the diagnosis of renal or ureteral stone.

The presence of a stone in the uninfected pelvis of a kidney or ureter does not give rise to a purulent secretion. That the pus is often due to infection is evidenced by the fact that in 26 of our 32 stone cases pyuria was noted, in 4 it was absent, and in 2 it was unrecorded. It was also present in 7 cases in which stone was not found.

The presence of pus in the urine from one kidney and its absence from that drawn from the other by ureteral catheterization is, of course, a valuable sign of renal infection, and, with other confirmatory evidence, is often of value in determining the presence or absence of stone.

Cystoscopy and ureteral catheterization were employed in 36 cases of this series, *radiography* in 35. The reason why these aids to diagnosis were not employed in a larger percentage of the cases is that it is only within the last five or six years that our hospital facilities permitted their regular use. Moreover, not a few of these cases were seen and operated upon in the country where these aids were not available.

The cystoscope enables us to note the condition of the mucous membrane of the bladder, the appearance of the ureteral orifices, the efflux, and to a certain extent the character of the urine excreted from each kidney. The ureteral catheter enables us to discover any ureteral obstruction and to obtain the separate urines; positive diagnosis of stone can be made by the cystoscope only when the calculus can be seen protruding from the ureteral orifice; positive diagnosis with the ureteral catheter only in the female, when the stone lies low down in the ureter and can be touched with a metal catheter or bougie. The presence of an œdematous ureteral meatus suggests stone. When there is, in addition, pouting or eversion of the meatus, we suspect stone low down in the ureter. If obstruction is also encountered, the suspicion of stone is increased to a probability.

The presence of blood and pus from a kidney which has been the seat of an afebrile colic is confirmatory evidence of value, but by no means conclusive.

In twenty cystoscopic examinations in cases in which stone was found at operation, the meatal appearances and catheter findings suggested or tended to confirm the diagnosis in 11 instances, and were of no value in 9. In 16 cystoscopic examinations in cases of suspected stone in which no stone was found at operation, in 5 the findings were confirmatory of calculus, in 8 they indicated renal lesions, but not necessarily stone, in 1 the examination was negative, and in 2 the records were lost.

Regarding the results of our *x*-ray studies I can speak with much more confidence. In the 32 cases in which stone was found at operation 20 *x*-ray examinations are recorded, in which 18 were positive and 2 negative, both of the latter being in exceedingly corpulent individuals. In no instance during the past three years has an

x-ray plate failed to reveal a shadow when stone was found at operation. Of the 25 cases of suspected stone in which no stone was found at operation, in 15 radiographic findings are recorded. Of these, 9 showed no shadow, while 6 showed a shadow which was thought to be calculous. Of the 6 errors, 5 occurred over the region of the ureter and 1 over the kidney. Two of the shadows had not clearly defined edges, one over the kidney and one corresponding with the pelvic portion of the ureter. One very clearly defined shadow over the pelvic portion of the left ureter was found at operation to be a calcified appendix epiploica adherent to the peritoneum overlying the ureter.

In three other instances shadows were found near the tip of the transverse process of the fourth lumbar vertebra; on the right side twice, on the left once. In these three instances exploration proved negative. In one the shadow was thought to be due to calcification of a broken-down lymph node from a previous appendicitis, as the ureter was kinked by a dense band of inflammatory tissue.

If we follow the advice of Dr. Cole, and reject all plates which do not show the structure of the bone, the outline of the psoas muscle, and the transverse processes of the lumbar vertebræ, and look with suspicion on all shadows which do not have well defined edges, only four errors would be recorded in this series of cases.

Several sources of error must be considered in plates of the pelvic cavity, namely: calcified lymph nodes, phleboliths, calcareous masses in the sacrosciatic ligament, and calcified appendices epiploicæ, which have not to my knowledge been observed before.

If we include all cases examined, the *x*-rays gave positive evidence of the presence or absence of stone in 79 per cent. of our cases. If we exclude the imperfect plates and those in which the edges of the shadow were not distinctly defined, it gave accurate indications in 91 per cent. of the cases examined. If in addition we exclude the ureter plates, the results would be accurate in every instance, and we must therefore regard it as the most reliable means of examination which we possess.

Ureteral catheterization proved valuable in confirming our diagnosis, in definitely determining the side of the lesion, and in estimating the competence of the opposite kidney. It has been of positive value in certain instances by enabling the surgeon to touch a ureteral stone with a metal catheter or bougie in the female. It has also been useful with the *x*-rays, by introducing a catheter bearing a metal stylet into the ureter, to determine the probability of a given shadow being within or without the canal, although this might lead to error if the object causing the shadow lay in front or just behind the ureter, as in my case in which a calcified appendix epiploica lay just in front of the terminal portion of the ureter.

From a careful review of the above facts, I feel justified in stating

that there is no single symptom or sign, nor any group of symptoms or signs, that is absolutely pathognomonic of renal or ureteral calculus, unless the calculus lies in the lower ureter and can be seen or touched by a metal bougie or catheter.

The most important factors to be considered in making a diagnosis are pain, tenderness, hematuria, the results of radiography, cystoscopy, and ureteral catheterization. While vomiting, vesical irritability, pyuria, fever, and the presence or absence of a renal tumor are important, and will often help us to confirm or lead us to exclude other pathological conditions, too much reliance must not be placed upon them in the diagnosis of calculus. While pain and tenderness were present in practically 100 per cent. of our cases of stone, it must not be forgotten that they were also present in a large percentage of the cases in which no stone was found. That calculus may, and often does, exist without pain is evidenced by the statement of Bruce Clark, who reported 24 autopsies upon calculous patients, in 13 of which there had been no subjective symptoms during life. Hematuria was known to be present in 45 per cent. of our stone cases, but it was also present in 41 per cent. of the cases without stone. Spontaneous hemorrhage occurring during rest and sleep generally means newgrowth. Hemorrhage following active exercise or jolting, and accompanied by characteristic colic, in the absence of other demonstrable pathological conditions, is strongly suggestive of calculus.

In this connection it may be interesting to note that on five occasions I have observed calculus disease in both kidneys:

Case I.—Female child. Small calculus removed from right kidney. Well for six years, then symptoms on the left side. *X*-rays positive. Stone size of a cherry removed from pelvis of the left kidney. Recovery.

Case II.—Male, aged forty years. Kidney pain for twenty years, pyonephrosis right. Kidney incised and drained, stone removed. Later, pyonephrosis of the left, opened and drained, stone impacted in left ureter. Both sinuses remain open. Later, *x*-rays show stone in bladder and in lower end of both ureters. Bladder stone removed. Patient in good health with two lumbar fistulæ, refuses further operation.

Case III.—Female, aged thirty-eight years. Symptoms of stone in right kidney. Operation, stone found impacted in the upper end of gangrenous ureter. Nephrectomy. Six weeks later, anuria and colic on left side. Nephrotomy and removal of conical calculus impacted in mouth of ureter. Recovery.

Case IV.—Male, aged forty years. Stone removed from bladder. Later, symptoms on right side, pyonephrosis and calculus found. Nephrectomy. Later, symptoms on left side. *X*-rays positive, stone removed. Recovery. Later, returned with recurrence on left side. Refused operation, subsequently died of uremia.

CASE V.—Male, aged forty-two years. Symptoms of stone on right side. *X*-rays negative. Obesity. Four calculi removed from right kidney. Later, hemorrhage and emergency nephrectomy. Death from suppression of urine. Autopsy revealed multiple stones in pelvis of left kidney with marked pyelonephritis.

Recurrence of stone in a chronically infected kidney was observed in the following case: Male, twenty-five years of age. Traumatic rupture of bladder with fracture of pelvis. Slow convalescence. Ascending pyelonephritis of right kidney, followed by ureteral obstruction and pyonephrosis. Kidney incised. Stone removed, pyonephrosis drained, apparent recovery. Seven months later, symptoms returned. Kidney explored, found to be the seat of large abscess almost completely destroying cortical substance with large secondary calculus. Nephrectomy, followed by recovery.

INTERMITTENT HYDRONEPHROSIS. I desire to say a few words in regard to the cases of intermittent hydronephrosis. In 6 of my operative cases the symptoms were such as to justify the belief that we had to do with a frequently repeated temporary blocking of the ureter and distention of the renal pelvis. While these phenomena not infrequently were observed in our calculus cases, the present group comprises only those cases in which the ureteral obstruction was due to factors other than stone. One other case will be added which I saw in consultation and assisted at the operation, making 7 in all. In all there were afebrile attacks of violent renal neuralgia, the pain extending from the kidney along the course of the ureter to the groin. In some instances this pain would become constant if the attack were of long duration, and finally disappear with a copious diuresis.

In all the kidney was at times palpable. In 4 seen during an attack the kidney was distinctly enlarged. In 3 of these the kidney was subsequently found to be normal in size after the subsidence of the attack. In 4 instances at operation the renal pelvis was found to be enlarged and relaxed; in 3 it appeared normal.

This appearance of the renal pelvis is important, and to my mind clinches the diagnosis, for while we may easily be misled by a history of pain, vomiting, tenderness, and renal tumor, all relieved by a copious diuresis, one cannot doubt the conclusion that an enlarged flaccid and wrinkled renal pelvis means a recent distention. It also in my experience indicates a rather obstinate condition, as will be seen by a brief review of several case-histories:

CASE I.—A young, unmarried woman, who had repeated attacks of afebrile renal neuralgia, with vomiting and tenderness in the right flank. Seen during one of these attacks, there was present an enlarged and tender kidney. Next day, after diuresis, the tumor had disappeared. On operation a freely movable kidney was found, with enlarged and relaxed pelvis. Normal ureteral implantation; sinus easily palpated; no stone. Kidney replaced and anchored

by chromic catgut sutures. During convalescence she experienced another attack more severe than any previous seizure. Would consent to no operation which would not guarantee a cure. The kidney was therefore removed, with prompt healing and permanent cure.

CASE II.—History almost identical with the former. Case seen with Dr. A. S. Clark, of New Brunswick. At operation, renal pelvis was found to be relaxed and enlarged; nothing else observed. Kidney drawn upward to straighten ureter and securely anchored in place. Recovery from operation, but recurrence of attacks, which, several months later, became unbearable. Nephrectomy finally performed, with complete relief of pain and great improvement in general health.

CASE III.—Female, aged twenty-five years. For two years has experienced attacks of severe right-sided pain, with swelling in the flank, often accompanied by nausea and vomiting. No fever, no hematuria, no frequency in urination. *X*-rays negative. At operation kidney pelvis was found moderately distended with the ureter implanted at its upper extremity and acutely kinked. A large diamond-shaped section of the posterior wall of the pelvis was removed and the wound closed with a fine catgut continuous suture, reinforced by a layer of the fibrous capsule of the kidney, which was stripped from the organ and sutured over the wound in the pelvis. She made a rapid and satisfactory convalescence. No leakage. Primary union of the wound.

CASE IV.—An unmarried female, aged twenty-nine years. Suffered for twelve years from recurrent attacks of severe left-sided renal colic, with swelling of the flank. Duration of the attacks from a few hours to four or five days. Patient greatly emaciated by prolonged suffering. Renal tumor distinctly felt, which was as large as an egg-plant and exquisitely tender. No fever, moderate hematuria on one or two occasions. On operation, kidney found displaced downward. Renal pelvis greatly distended. Dense vascular band extending from lower pole of the kidney to aorta (an aberrant renal artery). This band caused a constriction of the dilated pelvis, forming an hour-glass tumor with distortion of the ureteral implantation and obstruction of the tube. The band was divided between two ligatures, and the fluid contents of the pelvis evacuated by moderate compression. The kidney was pushed up into its normal position, which served to straighten the ureter, and the organ firmly anchored in place. The wound healed kindly, but the patient was never free from pain, and several weeks later had a severe attack, with the development of a large renal tumor. Nephrectomy was followed by complete relief. Examination of the specimen showed great thickening of the ureter at the point of previous pressure.

It will thus be seen that in the 4 cases in which an enlarged and relaxed pelvis was found at operation, only 1 was cured by the

primary operation, and that was by an extensive plastic procedure which greatly reduced the size of the pelvis. The other 3 required secondary nephrectomy.

Of the 3 cases in which no enlargement of the pelvis was noted all were apparently relieved by anchoring the kidney in place.

GANGRENE. A single case of complete gangrene of the kidney was observed in this series. A married woman, aged forty years, suffered for two months from right-sided renal colic, with vomiting and pyuria. An exploratory operation was done by another surgeon. The kidney was delivered through a lumbar incision and carefully examined for stone or other lesions. As the examination proved negative, the kidney was replaced and anchored by catgut sutures. Considerable pain followed the operation, with fever, vomiting, and great tenderness. These symptoms increased in severity, and the general condition became alarming. The wound was therefore reopened and the kidney found to be completely necrotic, evidently from strangulation of the vessels due to a twisting of the pedicle, the kidney having been replaced at the first operation in an inverted position, with the lower pole uppermost. The necrotic kidney was removed and the patient made a satisfactory recovery.

ACUTE UNILATERAL HEMATOGENOUS INFECTIONS. I now desire to speak of a series of cases, the study of which has proved most interesting to me. I refer to the acute hematogenous infections, in which the lesion is limited to one kidney.

While all surgeons of experience recognize the fact that in many of the suppurative lesions of the kidney the infection reaches the organ by the blood current, and while most observers readily recognize the terminal lesions produced by this pathological process, three important facts regarding the behavior of this form of infection are not generally appreciated by the profession. The first is that these lesions are often unilateral, the second that in the severest type of the affection the toxemia is so overwhelming that death often occurs before any characteristic renal symptoms are developed, and the third is that these cases in their early symptomatology vary greatly, the clinical picture often suggesting an acute grip, lobar pneumonia, appendicitis, or cholecystitis.

In March, 1906, I called attention to this type of infection in a paper read before the Chicago Medical Society, entitled "Some Observations upon Acute Unilateral Septic Infarcts of the Kidney." In it I reported 13 cases, 11 occurring in my own practice, and 2 in the service of my colleague, Dr. Joseph A. Blake. Since the publication of that paper I have observed 8 or 10 additional cases.

Two factors are necessary for the production of this type of renal lesion: (1) A septic focus somewhere in the body capable of furnishing a certain number of pathogenic bacteria to the blood current; and (2) a diminished resistance on the part of one kidney due to trauma, the presence of a calculus, an obstructed ureter, or a

previous septic lesion. The disease, therefore, not infrequently follows pneumonia, tonsillitis, any of the exanthemas, typhoid fever, a furuncle, or possibly obstinate constipation, as the colon bacillus is often the offending organism.

In a number of instances I was able to reproduce these lesions in animals by providing the above described conditions. A report of these experiments was included in the paper to which reference has already been made.

With regard to treatment the cases should be divided into three distinct groups: (1) The severest type, in which nephrectomy is necessary to save life; (2) a milder type, in which relief is often afforded by decapsulation and opening and draining the cortical foci; and (3) the mildest type, in which no surgical treatment is necessary.

To illustrate each of these types I shall quote the histories of a few patients previously reported:

CASE I.—A woman, aged twenty-two years, experienced a severe pain in the epigastrium and right side of the abdomen, with vomiting and high fever. She was sent to the Roosevelt Hospital with a diagnosis of acute appendicitis. On examination, the appendiceal region was free from evidences of inflammation. There was, however, pain and muscular rigidity in the right hypochondriac region, with tender points over the gall-bladder and in the costovertebral angle. Temperature, 105° F.; pulse, 120; leukocytes, 18,000. Cystoscopic examination was negative; urine from the right kidney scanty and slightly albuminous, a few pus and blood cells; that from the left kidney was abundant and apparently normal. Widal negative; no plasmodia; no tubercle bacilli in the urine. The diagnosis rested between an acute infection of the gall-bladder or the kidney. Small anterior incision, gall-bladder and liver found to be normal, but the right kidney seemed to be enlarged. Anterior incision united and the kidney exposed by lumbar route. The perinephritic fatty tissue was œdematous; the kidney enlarged, highly congested, and the seat of innumerable small infarcts. Nephrectomy was performed. After operation the temperature fell from 105.5° F. to 97° F. within twelve hours, and thereafter remained practically normal. The patient made a satisfactory convalescence. Microscopic examination of the specimen showed it to be filled with minute embolic abscesses. One year later this patient married and became pregnant. I had an opportunity of examining her urine before and after her confinement. It was normal in every respect. Her confinement was normal, and she presented the picture of robust health two months later.

CASE II.—A woman, aged thirty-one years, was admitted to the Roosevelt Hospital in a condition of profound septic intoxication. She had had occasional attacks of abdominal pain, of short duration, for the previous six months. Eleven days before admission she experi-

enced severe pain in the right side of the abdomen and flank, extending upward to the chest; this was accompanied by chills, high fever, delirium, and great prostration. At the time of her admission to the hospital, her temperature was 106.5° F; pulse rapid and weak; leukocytes, 35,000. On palpation the only signs that could be elicited were tenderness and muscular rigidity in the right kidney region. The urine contained albumin and a few pus cells. As her condition was extremely critical, she was immediately prepared for operation. On exposing the right kidney there was found a small focus of pus in the fatty capsule near the kidney cortex. The condition of the patient would not admit of further exploration, and she was saved from death on the table only by an intravenous infusion of salt solution. The temperature rapidly rose to 112° F., and she died in a few hours. Autopsy revealed only multiple abscesses and infarcts of the right kidney. Cultures showed Staphylococcus pyogenes aureus.

These 2 cases illustrate the severest type of the disease. The following case presents evidences of a milder type of infection.

Case III.—A woman, aged twenty-six years. Complained of severe right-sided abdominal pain, with nausea, headache, fever, and general prostration. Ten days later she was admitted to the Roosevelt Hospital. Temperature, 102°; pulse, 120; leukocytes, 19,000, of which 81 per cent. were polynuclears. Complained of a bearing-down sensation on urination. The following day the temperature rose to 104°; 82 per cent. polynuclears on differential count. Cystoscoped. Bladder negative; ureters catheterized; from right there was a scanty flow of urine containing albumin, a few pus cells, and blood; from left, more abundant flow, few red cells, practically no pus. Physical examination revealed tenderness in the right costovertebral angle. Kidney not palpated. Left side free from tenderness. Operation on tenth day of illness. Right kidney exposed by lumbar incision; œdema of perirenal fat. Kidney highly congested; presented six distinct cortical areas of induration. Each of these was opened and packed with separate strips of gauze tape, which were allowed to protrude through the partly closed parietal wound. Of the six lesions, only one contained pus, the others necrotic tissue. The renal pelvis was opened; the mucous membrane appeared normal. Cultures made from the pus showed Bacillus coli communis. The patient made a tardy but complete recovery.

Case IV.—A young man, aged twenty-three years, was operated upon by me for an acute streptococcic appendicitis with spreading peritonitis. Although quite septic at the time of operation, he made a satisfactory convalescence. About the sixth day after operation, when the temperature had fallen to the normal, he experienced an acute stabbing pain over the lower ribs on the left side, with a sharp rise of temperature. I regarded the case as one of acute pleurisy, but on physical examination was surprised to find no definite signs

in the chest. I called an expert medical consultant, who also was unable to find evidences of plural infection. We were at a loss to account for the pain and fever, which continued for two or three days, when a urinary analysis showed a trace of albumin and a small number of pus and red cells. Subsequent examination revealed the characteristic costovertebral tenderness, and daily examinations of the urine showed the unmistakable evidences of renal infection. The symptoms persisted for ten days or two weeks, but were never severe enough to warrant operative interference.

A few words now regarding diagnosis. The disease may or may not be ushered in by a chill. When present, it generally indicates a severe type of infection. The initial rise of temperature is high, generally 104° F. or 105° F.; the pulse is frequently 120 or above. The toxemia is marked from the first, and with the high fever suggests often an acute grip, lobar pneumonia, or one of the exanthemas. Then follows a more or less vague pain in the abdomen or flank corresponding to the side of the lesion. Tenderness and muscular rigidity over the region of the appendix or gall-bladder leads often to error in believing one of these organs to be the seat of disease. As the urinary secretion from the infected kidney is greatly diminished and is largely diluted by the abundant secretion from the unaffected organ, the mixed urine when passed or drawn from the bladder is often quite normal in appearance, and the slight trace of albumin, blood, and pus is often overlooked unless a more than ordinarily careful examination is made. The one pathognomonic sign present in all cases is a marked unilateral costovertebral tenderness.

To illustrate how frequently this condition resembles an acute intra-abdominal infection, I may state that in no less than six instances during the past three years I have known of a primary incision being made in the abdomen on the belief that the symptoms were due to appendicitis or cholecystitis. In each instance the abdominal cavity was found to be free from infection, the laporatomy wound was closed, and an acutely infected kidney was discovered by a lumbar incision.

Diseases of the Ureters. I desire in conclusion to record briefly my experience in the surgery of the lower ureter. Nine exploratory ureterotomies have been performed for the removal of a suspected stone. In 4 one or more stones were found, while in 5 the result of the examinations were negative.

Case I.—Male, aged thirty-four years. Suffered from right-sided renal colic for twenty-six years. Hematuria and pyuria present. Right kidney explored for stone, with negative result, six months before admission. *X*-ray examination showed dark shadow near spine of ischium. Ureteral orifice everted, catheter arrested in lower ureter. Operation, eight inch incision parallel to Poupart's ligament; external oblique aponeurosis split; internal oblique and

transversalis muscles divided transversly. Peritoneum separated from iliac fascia and right side of pelvis. Ureter found and followed to floor of pelvis. Stone felt near ischial spine. Ureter much thickened and dilated above calculus, which was pushed upward to brim of pelvis. Longitudinal incision in ureter, irregular mulberry stone removed. Ureteral wound closed by five chromic catgut sutures, muscles united by plain catgut. Cigarette drain to retroperitoneal space. Skin united with silkworm-gut. Prompt recovery.

CASE II.—Male, aged forty-nine years. Suffered from right-sided colic and frequent micturition for two or more years. *X*-rays showed oblong shadow near vesical end of right ureter. Cystoscopic examination showed eversion and œdema of right ureteral orifice. Ureter exposed by same incision as in first case. Calculus felt at junction with bladder. Ureter opened near pelvic brim for exploration with metal bougie. Attempt to push calculus upward to ureteral wound unsuccessful. Second opening over stone, which was easily removed. Both ureteral openings sutured with fine chromic catgut, the lowermost with considerable difficulty. Wound closed. Primary healing.

CASE III.—Female, aged forty-three years. Suffered from attacks of left-sided pain for sixteen years. Has had left ovary and tube removed, kidney and ureter explored, and ventral hernia operated upon without relief. Blood and pus in urine. *X*-ray examination showed small distinct shadow at vesical end of ureter. Bladder opened above pubes. Metal bougie introduced into left ureter. Stone felt one-half inch above meatus. Ureteral orifice enlarged and stone removed by forceps. Suprapubic wound closed. Frequent catheterization. Primary union and complete recovery.

CASE IV.—Female, aged forty years. Left-sided colic for eighteen years, becoming more frequent and severe for last eighteen months. Slight hematuria and frequency. Cystoscopic examination. Ureteral orifice puffy. Ureteral catheter meets slight obstruction at seven inches, which is, however, easily overcome, and passed to pelvis of kidney. *X*-rays show distinct shadow near pelvic brim. Ureter explored in usual manner. Stone felt just below brim, easily pushed upward to dilated portion of ureter, and removed through longitudinal incision. Wounds closed in usual manner. Complete healing under first dressing.

CASE V.—Male, aged thirty-six years. Severe pain in left flank; vomiting, with tenderness over kidney. Hematuria. *X*-ray shadow faint and without well-defined edges near ischial spine. Cystoscope. Ureteral orifice everted, blood emerging; could not be catheterized. Ureter explored by abdominal incision, opened, and found to be patent. Bougie seen in bladder by cystoscope. Wounds closed in usual manner. Prompt healing.

CASE VI.—Male, aged forty-eight years. Mild pain over lower left ureter on walking. No urinary symptoms, no vomiting,

no pain, no tenderness over kidney. Tenderness in left inguinal region. Distinct shadow on *x*-ray plate in left half of pelvis. Ureter explored by usual incision, hard mass felt in contact with ureter. Ureter opened, probe passed easily to bladder and to pelvis of kidney. Peritoneal cavity opened. Calcified appendix epiploica of sigmoid adherent to parietal peritoneum over ureter. Wounds closed. Primary healing.

CASE VII.—Female, aged twenty-six years. Pain in right inguinal region for several months. Appendix removed without relief. Pain paroxysmal, radiating from kidney to groin. Microscopic blood in urine. Cystoscoped. Ureteral orifices normal. Ureteral catheter meets obstruction near kidney pelvis. *X*-rays show faint shadow just above posterior iliac spine. Ureter explored by longitudinal incision in flank. Marked angulation caused by inflammatory band. This was removed, the ureter opened, and bougie passed upward to kidney and downward to bladder. No further obstruction encountered. Wounds closed. Primary healing.

CASE VIII.—Male, aged forty-five years. Admitted for operation for chronic appendicitis. *X*-rays showed small round shadow near transverse process of fourth lumbar vertebra on the right side. Abdominal incision over appendix to retroperitoneal space. Ureter explored, opened, and sounded, with negative result. Peritoneal cavity next opened and diseased appendix removed. All wounds closed in usual manner. Primary union.

CASE IX.—Male, aged forty years. History of left-sided colic for four years, becoming more frequent during past three months. Pain very severe, radiating to groin. Cystoscoped urine from left kidney blood stained, that from right clear. *X*-rays showed round shadow near transverse process of fourth lumbar vertebra, which corresponded to point of greatest tenderness to pressure. Ureter and kidney explored, no stone found; only an inflammatory thickening around pelvis of kidney. Recovery.

In all of the nine cases healing occurred primarily without infection and without leakage of urine.

All of the patients in whom stone was found suffered severe pain with frequent and painful micturition, and had hematuria. In the three examined with the cystoscope a pouting and œdematous ureteral orifice was seen; in one the ureteral catheter met with moderate resistance, but easily passed the stone to the kidney pelvis. All had shadows with distinctly defined edges. All of the stones were more or less oblong. In one of the negative cases the shadow was distinct and characteristic, and was due to a calcified appendix epiploica. The others were more or less definite; three were round. In the case with a markedly everted ureteral meatus from which blood emerged, but which could not be catheterized, there is reason to believe that a stone may have been present at the time of examination and been passed before or during the operation.

THE EPIDEMIOLOGY OF ACUTE POLIOMYELITIS.

A STUDY OF THIRTY-FIVE EPIDEMICS.

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A new interest in poliomyelitis has been aroused in the last four or five years, by reason of its prevalence in an epidemic form more extensive than had been hitherto observed. Of special importance have been the epidemics in Norway and Sweden, since 1893, and the epidemic in New York City and vicinity, in 1907. Studies made in these epidemics have added much to our knowledge of the pathological anatomy and clinical history of acute poliomyelitis. Nothing, however, that is definite has yet been discovered as to its causation. The occurrence of the disease epidemically has practically established its infectious origin.

Since, at most, accounts of only twelve or fifteen epidemics have been brought together in one paper, it has seemed desirable at the present time to make as complete a collection as possible of the epidemics of this disease which have thus far been reported. An effort has been made to trace these reports to their original sources, on account of the vague and often conflicting references to the epidemics which are scattered through medical literature. The original reports have been consulted in all but a single instance (No. II).

We have collected reports of 35 epidemics of poliomyelitis prior to the year 1907. A careful investigation of this New York epidemic, of 1907, by two of the medical societies is now in progress and will shortly be published. For this reason we have not attempted to include it. The epidemics are widely separated both in time and location, and the records of many of them are very meagre. In fact, few of them have been reported with a degree of care which makes a detailed study of them of great value, although collectively they throw considerable light upon the disease. In the accompanying table, the main facts contained in these reports are summarized.

The first recorded epidemic that we have been able to find occurred in West Feliciana, La., in 1841. It is described as follows: "While on a visit to the parish in the fall of 1841, my attention was called to a child, one year of age, slowly recovering from hemiplegia. The parents, who were people of intelligence and unquestioned veracity, stated that 8 or 10 cases of either hemiplegia or paraplegia

had occurred during the preceding three or four months within a few miles of their home. Some of these had recovered completely; others were improving." The report concludes with the sentence: "The little sufferers were invariably under two years of age, and the cause seemed to be the same in all, viz., teething." We have no difficulty in recognizing poliomyelitis from the description given.

LOCATION AND EXTENT. The epidemics have been widely scattered over the civilized world. It is rather surprising that no less than 5, and among them the most extensive epidemics recorded, have occurred in Norway during the last ten years. The number of cases reported has varied greatly in the different epidemics; in most of them the number is small. In some the cases were so few as scarcely to deserve the name epidemic. We have included them only because they are frequently referred to in literature. In 23 of the epidemics the number of reported cases is less than 20; in 7 there were from 20 to 50 cases; in only 4 were there over 100. In the epidemic occurring in Australia, in 1904, there were 108 cases; in the one occurring in Vermont, in 1894, 132 cases; in all Norway, in 1905, 719 cases, and in 1906, 334 cases.

On account of their extent, the Norway epidemics deserve more than a mere mention. The cases reported in 1905 and 1906 have been included in the table as single epidemics, but the disease prevailed over a large extent of territory. There were really several distinct epidemic centres of the disease in both years. We have been able to secure details of the cases occurring in 1905; those for 1906 are not at present available. The reports are made by districts. The location of the districts mentioned in 1905 and their relation to one another are shown in the accompanying map, which indicates how widely separated were the epidemic centres throughout the country. The districts are in most instances extensive, covering areas of many hundreds of square miles. The number of recorded cases occurring in northern Norway was much greater than those in the southern half of the country, although the number of centres is smaller. The reports from the northern districts include also the cases occurring in the islands along the coast, where many were observed.

SEASON. The seasonal occurrence of epidemics is strikingly uniform. In 33 it is definitely stated that the epidemic occurred during the hot season only, or summer and early autumn, the most frequent months being July, August, and September. In almost every instance the epidemic terminated with the month of October. In one Australian epidemic the months of occurrence were March and April, which correspond to October and November in our climate.

RECURRENCE OF THE DISEASE IN A LOCALITY AFTER AN EPIDEMIC. In studying this subject the question naturally arises whether epidemics have been followed by an increased number of

sporadic cases in succeeding seasons, as is seen so often after epidemics of cerebrospinal meningitis. In but one instance have we found it stated that this was the case. In Conegliano, Italy, in 1896, there were 9 cases; the following year in the same village there were 13 cases. After the Stockholm epidemic of 44 cases, in 1887, there were observed during the next seven years but 46 sporadic cases, and these were distributed through all seasons of the year. After several of the epidemics (X, XVI, XXI, XXVI), including some of

Map of Norway, showing epidemic centres of poliomyelitis in 1905.

the larger ones, the statement is made that in succeeding years there was not only no prevalence of acute poliomyelitis, but no cases were observed. From the evidence obtainable it seems altogether improbable that any increase in the number of sporadic cases usually follows an epidemic. In Norway, although successive epidemics were reported in the years 1903, 1904, and 1905, it does not appear, from the reports, that the same communities were attacked. In some it is said that this was not the case. Regarding the epidemic of 1906, published details are wanting and positive statements cannot be made.

Topographical Location and Hygienic Surroundings. Location and surroundings seem to have little influence upon the occurrence of epidemics. While in several instances these have been observed in large valleys, it is noted that many of the patients lived upon hillsides, in the best surroundings. The epidemics have been about equally divided between country and city. Most frequently the disease has prevailed in a city or town and the outlying country district, often over quite a large area. Five of the epidemics were in country districts only; and 8 were in small villages.

In the majority of instances it is mentioned that the hygienic surroundings were good. The only example of an epidemic in a crowded community is that in Norway, in 1905, when the disease prevailed with especial severity in the huts of the fishermen living in squalor on the islands along the coast. In a number of instances epidemics have occurred during seasons of little rainfall and low streams. While this is of very doubtful significance, it attracted sufficient notice to be recorded by six or seven observers.

Association with Other Diseases. The association of poliomyelitis with diseases other than those of the nervous system is mentioned in only a few of the epidemics, and then evidently with a bias as to its relation. The range has been wide, including measles, whooping-cough, scarlet fever, mumps, and influenza. Especial care has been taken to secure references to diarrhœal diseases. In one Italian epidemic (XXX) it is stated that enteritis preceded in 3 of 26 cases. In the account of the Stockholm epidemic, in 1895, it is said that cholera infantum was especially severe at the time. It is, however, recorded of the Vienna epidemic, of 1898, that while both cerebrospinal meningitis and gastro-enteritis had prevailed the preceding year, they were not common during the epidemic of poliomyelitis.

It is not possible, from the statements made, to draw any deductions as to the association of poliomyelitis with any other disease. In the great majority of the cases the definite statement is made that most of the children were in good health at the time they were taken ill.

The association with certain nervous diseases, especially Landry's paralysis, acute encephalitis, and multiple neuritis, has been mentioned in a few of the epidemics (XV, XXIV, XXV). It is highly probable that in nearly or quite all of these instances these statements are explained by errors of diagnosis. Landry's paralysis has been diagnosticated in a number of instances in which spinal symptoms have been followed by those indicating involvement of the medulla and often proving fatal. These are now believed to represent only a severe form of poliomyelitis with involvement of the upper nerve centres. The same is true of cases of acute encephalitis in which the spinal symptoms are few or wanting altogether. Multiple neuritis has often been diagnosticated because of the severity of the pains in the early stage of the disease, since it was not formerly

appreciated that this may be a marked symptom in many cases of poliomyelitis.

MORTALITY. It is difficult to obtain an idea of the percentage mortality when acute poliomyelitis occurs as a sporadic disease. Most of the writers on the subject give the impression that the danger to life is very slight. A study of epidemics, however, leads to a different conclusion. The figures for the separate epidemics are given in the table. Including those in which the mortality is given, there is a total of 1659 cases with 201 deaths, a mortality of 12.1 per cent. The discrepancy between these figures and the opinions drawn from a study of the sporadic form of the disease is, we believe, explained by the fact that cases with bulbar symptoms, which make up the most of the fatal cases in epidemics, have not been recognized as poliomyelitis when they occurred in scattered instances.

AGE. The great majority of the persons attacked with acute poliomyelitis in epidemics are children under four years of age, just as is seen when the disease occurs sporadically. But in epidemics it appears that a somewhat larger proportion of older children and adults are attacked than at other times. Exact figures as to age are seldom given, but in the Vermont epidemic it is stated that a man of seventy years of age was attacked, and in the Dutchess County epidemic, "adults as well as children." In the Australian epidemic of 108 cases, 11 were over ten years of age, the eldest being fifteen years of age.

COMMUNICABILITY. Perhaps the most interesting questions suggested by a study of epidemics of acute poliomyelitis relate to the manner in which this disease is spread. Does any evidence exist that the disease is contagious? Is it possible in an epidemic to trace a connection of any kind between the different cases, either through direct contact or otherwise?

The observations made upon these points fall into certain groups: (1) The general distribution of the cases; (2) the occurrence of more than one case in a family or household, and the interval between the onset in the different cases; (3) the development of poliomyelitis, after contact with a person suffering from the disease in an acute stage, or after moving into a district where the disease is prevailing. It is unfortunate that in the majority of the reports no data whatever are given upon the subject of the distribution of the cases. The following statements contain about all the different writers have to say upon this point:

"The cases were well distributed over the city except for one instance of two in a family" (No. VI).

"No instance of 2 cases occurred in the same street or house" (No. XXI).

"The cases, 64 in number, occurred in groups along the lines of communication. There were very few scattered cases" (No. XXVI).

"The only important group of cases occurred around the periphery of a cemetery" (No. XXVIII).

"The cases occurred in a city and the country roundabout. There was only one instance of 2 cases in the same street" (No. XXXIII*a*).

The comparatively small number and wide distribution of the cases in most of the epidemics is very striking, and seems to indicate that the different cases had no relation to one another or to a common cause. As an offset to these there are, however, records of certain groups which, in the aggregate, are very significant and which point quite definitely to a connection between different cases, indicating either a communication of the disease from one person to another, or the development of several cases near together from a common cause.

We have taken especial care to secure the data regarding the occurrence of more than one case in a family or household. On this subject we have included not only facts derived from a study of the epidemics here collected, but also other single instances which have been scattered through literature.

In all we have collected a total of 40 instances, comprising 96 cases, in which more than 1 case occurred in a family or household.

	Instances.
Two cases in a family	31
Three cases in a family	5
Four cases in a family	3
Seven cases in a family	1

The definite interval between the attacks is stated in 29 instances as follows:

	Instances.
Children taken ill the same day or simultaneously	8
Interval one day	2
Interval two days	1
Interval three days	1
Interval four days	5
Interval five days	2
Interval six days	2
Interval seven days	5
Interval eight days	2
Interval six weeks	1

In 10 additional instances the interval is given in the following words:

	Instances.
Attacked at about the same time	1
Attacked in rapid succession	2
Attacked within a few days	2
Attacked two others shortly after first case	1
Attacked seven children within period of ten days	1
Attacked between five and seven days	1
Attacked between six and thirteen days	1
Attacked between seven and ten days	1

Omitting from the above statements the single case which occurred after an interval of six weeks, which belongs apparently to a different category, and the doubtful case, which occurred after an interval of six to thirteen days, there are 37 instances in which the second case followed the first within ten days, and 33 instances in which the interval was less than one week, while in 13 instances the attacks occurred at about the same time or within twenty-four hours.

The circumstances under which some of these groups of cases occurred are very interesting, and deserve special mention. It is hardly necessary to add that we have included no cases in which the diagnosis of acute poliomyelitis seemed questionable.

Seven Cases in One Family. An English writer, W. Pasteur, records[45] an interesting series of seven children who, he says, "were attacked in the course of ten days, with acute fever; paralytic symptoms followed in three; in two more, temporary disturbance of nervous equilibrium; in the remaining case only the general symptoms present." All these cases were regarded as poliomyelitis. The house in which they lived was situated upon high ground in a healthy neighborhood. The children were previously healthy. Ages ranged from eighteen months to eleven years. No other disease was prevailing at the time.

Four in One Family.[32] Two sisters were taken ill within six days of each other; the father, seven days later; a son, "two days after the father's death."

Four Cases in the Same House.[40] A girl, aged sixteen years, was attacked August 6; a boy, aged one and one-half years, August 14; an infant, aged nine months, August 22; a man, aged twenty-five years, October 4, after a drunken spell. (This is the interval of six weeks referred to above.) There lived in one room, on a small island, a father, mother, and two sons, aged respectively six and sixteen years. Father and one son fell sick simultaneously; one week later the other son was attacked; one week after this, the mother; the surroundings were described as wretched.[42]

Five Groups of Three in One Family. The following are the data furnished regarding these groups: In one family three children, aged respectively nine, two, and six years, were attacked. The child of two years was taken ill two days after the child of nine; the child of six, five days after the child of two years.[42] Three children in the same family were attacked one "shortly after the other."[42] Three children, aged five, four, and two and a half years, were attacked, respectively, on November 10, 13, and 17. The first child died on the seventh day; the second died on the fifth day; the third child recovered. It is stated that two of the children on the day before the attack were "thoroughly soaked."[46] Two children were attacked on the same day, a third child twenty-four hours later.[47] Respecting another group, it is simply stated that three cases occurred in one family.[47]

Two Cases in a Family. Three examples of this have come under the personal observation of one of us (Holt), as follows:

A boy, aged fourteen months, was taken ill on the 23d of the month, and died on the 27th, with bulbar symptoms. A sister, aged five years, was taken ill on the 26th, and recovered with paralysis of both lower extremities. No other cases are known to have occurred in the town at the time (Elizabeth, N. J., 1905).

During the epidemic of 1907, in a family living in a village near New York, a boy, aged eight years, was taken ill on Sunday and died on the following Sunday morning. His brother, aged five years, was attacked the day before the death of the older boy, and recovered with paralysis. No other children in the family. Only one other case in the village, living more than a mile away.

There were admitted to the Babies' Hospital, in October, 1907, two children, aged about two and a half years, from a country home containing about twenty young children. The children attacked with poliomyelitis occupied adjoining beds in the institution. The second child was taken ill seven days after the first one. There were no other cases in the house.

The following examples of two cases in a family or household have been furnished to us by Dr. Charlton Wallace, of the Hospital for Ruptured and Crippled. The cases occurred in the epidemic of 1907:

Two children of the same family, aged respectively ten months and two years, were attacked simultaneously on July 21. Paralysis was noted in both children on the third day, in one affecting both lower extremities, in the other, the left upper. Paralysis was permanent in both.

Living in the same house, but not belonging to the same family, were an infant, aged seven months, and an older boy (age not given). The older boy was attacked with acute poliomyelitis, and the infant was almost constantly with him during the acute stage. One week after this exposure the infant came down with the same disease, the paralysis involving all four extremities.

Living in the same house, but upon different floors and belonging to different families, were two children. On August 7 one child was attacked with acute febrile symptoms, paralysis of the right arm being noted on the third day. The next week the second child fell ill, paralysis developing on the 22d. The two children played together frequently during the week from August 7 to August 14.

Among the other collected examples of two associated cases are several which present features of especial interest.

It is rather striking that there are five instances recorded in which twins were attacked with the disease.

After exposure in bad weather a brother and a sister both fell ill on the same day with fever, and both, three days later, developed paralysis.[49]

Very striking is the grouping of the patients in one epidemic (No. XII) of 17 cases. One group of 10 occurred in the same neighborhood; 2 cases were in the same house; 2 others were sisters; 2 others were brothers; the other 4 children attacked lived near by. In the second group there were 7 cases in the same neighborhood; 3 occurred in the same family; a fourth lived in an adjoining house, and was attacked just ten days after he came there to reside; the other 3 children lived close by.

Two brothers were attacked four days apart. Four days after the second case, a playmate came down with the disease. He was the son of the physician who attended the other patients. In all, 4 cases occurred in a small community of 42 persons (No. XXV).

Besides the instances just referred to, there are a number of others recorded, in which the disease developed shortly after the child moved into the infected district or shortly after leaving it, or under other circumstances which suggest contagion.

A child came to visit in a small village, where poliomyelitis was prevailing (No. XXVI), and was taken ill ten days after arrival.

In one house were three children ill with acute poliomyelitis (No. XII). A healthy child, living at a distance, came to live in an adjoining house, and was attacked with the disease ten days after.

Two children of a physician were attacked ten days after their return to New York, in September, 1907, during the prevalence of the epidemic. The children, a boy, aged eight years, and a girl, aged three years, were taken ill on the same day and at about the same hour. The onset was severe in both cases. The paralysis involved one leg in one child, both legs in the other. The recovery was rapid and practically complete (personal communication).

A brother and sister, aged respectively nine and twenty-seven months, living at a distance, were taken into a town where the disease was prevailing, in the morning, and on the same night, after returning home, both were attacked with fever, which was followed by paralysis (No. V).

A brother and sister, aged respectively five and seven years, were living in a small town outside of London. Two days after the sister was attacked with poliomyelitis the brother was removed to London, where he himself came down with the disease five days later.[48]

On September 1, 1907, a child, aged fourteen months, was taken ill, and paralysis developed on the third day. On one of these three days (we were unable to determine exactly which one) a friend with an infant, aged nine months, paid a visit and put the child in the same crib to sleep with the child suffering from poliomyelitis. On September 8 the second child was taken with fever followed by paralysis. It is a matter of some interest that the first child was said by the mother to have been in contact with a recent case of acute poliomyelitis fourteen days previously; but these facts could not be substantiated (Dr. Charlton Wallace).

Number of epidemic, year, and season.	Place.	Topography and hygienic surroundings.	No. of cases.	Deaths	More than 1 in family.	Relation to other diseases.	Author.	Reference.	Remarks.
I, 1841 Summer months	Parish of West Feliciana, La.	Cases within 3–4 miles of each other	8–10	None	.....	.....	Colmer, Geo.	1. Amer. Jour. Med. Sci., 1843, vol. v, p. 248	
II, 1881 July	Umea, Sweden	.....	13	....	.....	.....	Bergenholz	.....	Original article not found. Referred to by Medin. Hygeia, vol. lii, 1890.
III, 1883 June	Arenzano, Italy	All in a small village	5	2	.....	.....	Buchelli	2. Il Policlinico, 1897	This epidemic referred to by Buchelli; original account of it not found (no evidence that a full report of epidemic was published).
IV, 1886 July–Sept.	Mandal Cidsvold Ski Laurdal Gjövisk Ruppestadt (Norway)	.....	9	2	No instance	.....	Leegard, C.	3. Om poliomyelit. med. demonstration og mikroskopiske präparter, Neurol. Centralblatt, 1890, vol. ix, p. 760 (Review of above article)	Leegard's original article not found in Surgeon-General's Library, Washington.
							Oxholm, N.	4. Beretning om Sundhedstilstanden og Medicinalforholdene. Norge, 1886, p. 102 5. Tidsskrift for Praktisk Medicin, 1887, p. 193 vol. 7	In same year epidemics reported in the bracketed districts. The statistics in the table refer to Mandal; no facts have been found regarding the other districts.
V, June–July	Sainte-Foy-l'Argentière, France	Village 1400–1500 inhabitants. Hygiene good	13	4	One instance two children	All in good health	Cordier, M.	6. Lyon Médical, 1888, vol. lvii, p. 5	Reported in detail, mainly clinical.
VI, 1887 May–Nov.	Stockholm, Sweden	City	44	3	One instance two children	.....	Medin, O.	7. Tenth International Med. Congress, Berlin, 1891, vol. ii 8. Hygeia, 1890, vol. lii	Majority of cases belonged to working class. 30 cases occurred between Aug. 9, and Sept. 30. From 1888 to 1894, 46 sporadic cases evenly distributed through twelve months.

VII, 1889 June–July	Thuringia	.....	5	....	.....	.....	Briegleb	9. Uber die Frage der infektiosen Natur der Ac. Polio. 1890	Cases seen in Poliklinik. No cases reported here before. Cases not close together.
VIII, 1893	Two villages near Saint Girons, France.	.....	5	....	.....	.....	.....	10. Gaz. des Hôpitaux, 1895, Sept 10, p. 1036	
IX, 1894 Aug.–Sept.	North Adams, Mass.	Lies between two rivers which meet in town; with one exception cases along these rivers. Land between is swampy	10	....	.....	.....	Brackett, E. G.	11. Trans. of the American Ortho. Ass'n., vol. xi, p. 132	Report very meagre in details.
X. July–Oct.	Rutland, Proctor, and small villages in Vermont	Otter Creek Valley, 30 by 15 miles. Most cases considerable elevation above creek. Hygiene excellent. People prosperous	132	18	One instance	Strong healthy children predominated	Caverley	12. Main report in Jour. Amer. Med. Asso., 1896, vol. xxvi, p. 1 13. Also in Medical Record, 1894, vol. xlvi, p. 673 14. Yale Med. Jour., 1894	26,000 population in epidemic district. Climax of epidemic, Aug. 1. Very dry season; surface water low; springs scanty. "13 patients over fourteen years old; 1 patient seventy years old". Animals affected, especially horses, with paralysis; also dogs and fowls; some postmortem examinations made showing cord lesions, so stated.
							Macphail	15. Med. News, vol. lxv, p. 619	
XI, 1895 (Maximum in Aug. and Sept.)	Stockholm, Sweden	Sanitary conditions excellent	17	None	One instance two children	Infantile cholera especially severe during these months.	Medin, O.	16. Archives des Médecin d'Infants, vol. i, p. 259, and p. 321	
XII, May–Sept.	Ravecca, Italy (section of Genoa)	Crowded quarters, unhealthy	17	None	Three instances; two in two families; three in one family	.....	Buchelli	17. Il Policlinico, 1897, vol. iv, p. 249	
XIII, June 23–July 10 One in Aug.	Commune de Montespertoli (near Florence), Italy	Scattered houses in country, in circle 2 km. in diameter. Healthy. All but one farmers	7	None	.....	Whooping-cough prevalent, but not so much in this exact section	Pieraccini	18. Lo Sperimentale, vol. xlix, No. 27	

Number of epidemic, year, and season.	Place.	Topography and hygienic surroundings.	No. of cases.	Deaths	More than 1 in family.	Relation to other diseases.	Author.	Reference.	Remarks.
XIV, March and April	Port Lincoln, Australia	Village and country, 1600 sq. miles with population 1500	14	....	Two instances; two in each family	All cases in good health	Altman	19. Australasian Med. Gaz., 1897 April, 24	Phosphorus widely used this year by farmers for fertilizing.
XV, 1896 Summer months	Greene Co., Alabama	Village and country 12 miles in diameter	15	None	.....	Much malaria at same time	Bondurant	20. Med. News, Aug. 18, 1900	Included in report are some of "adult cases thought to be endemic or malarial neuritis." No evidence of epidemic in rest of state.
XVI, July (middle) to first week in Aug.	Cherryfield, Me.	Village, healthy; situation "most salubrious"	7	1	One instance two children	All in good health	Taylor, J. M.	21. Phil. Med. Jour., 1898, vol. i, p. 208	No other cases before or since, *i. e.*, up to 1898 (for two years).
XVII, 1897 Summer	New York City	Six of the cases within radius ½ mile, north of Grand St. and east of Bowery; crowded section	12	....	.....	.....	Taylor, H. L.	22. N. Y. Med. Jour., 1897, vol. lxvi, p. 192	These cases all came to clinic in June witnin two or three weeks of onset. All were seen at Hospital for Ruptured and Crippled, out-patient department.
XVIII, July–Sept.	Conegliano, Italy	In and near city; elevated land; within 7–8 km.	9	....	.....	No other diseases	Fabis, P.	23. La Pediatria, 1901, May	Very meagre report.
XIX, 1898 July–Sept.	Conegliano, Italy	Same district	13	....	.....	No other diseases	Fabis, P.	24. La Pediatria, May, 1901	Second epidemic, same district, next season.
XX, Summer season	Frankfurt a. Main	City and suburbs	15	....	.....	Digestive disturbances, rickets, bronchopneumonia in some of the cases	Auerbach, S.	25. Jahr. f. Kinderheil, 1899, vol. l, p. 41	These cases (all recent ones) came into Poliklinik in single season. During previous five years only 11 cases were recorded.
XXI, 1898 July–Sept.	Vienna and suburbs	City and outlying districts	42	....	No instance	Previous year epidemic of cerebrospinal meningitis and gastroenteritis	Zappert, J.	26. Jahr. f. Kinderheilkunde, 1901, p. 125	This report compiled from records of the different children's hospitals; no other cases included. No instances of cases in same street or house.
XXII, June–Sept.	Kiel, Germany	.....	4	None	.....	.....	Von Pleuss, A.	27. Ueber gehäuftes Vorkommen spinaler Kinderlähmung	All these cases seen in Poliklinik.

XXIII, 1899 Sept.–Oct.	Valley of Arno, Italy	Within area 3 km.; country district; climatic condition excellent	5	None	.....	Rheumatism present in two families; in third, child had had rheumatism previously	Simonini, R.	28. Gaz. degli osp. e delle clinichi, April 9, 1899	Article written to establish a possible association with rheumatism.
XXIV, July–Oct	Poughkeepsie and Duchess Co., New York	City and country moderate elevation. Hygiene excellent	30	1	One instance two children	.....	Mackenzie, D.	29. Med. Record, 1902, vol. lxii, p. 528	Streams low; although not especially hot summer. Report in 1907 that he had seen no cases in the country district since epidemic.
							Chapin, H. D.	30. Arch. f. Pediatrics, 1900, vol. xvi, p. 807	
XXV, June and Aug.	Le Grand, San Joaquin Valley, Cal.	Small village, 42 inhabitants	4	None	One instance two brothers	.....	Newmark L.	31. Med. News, 1899, vol. lxxiv, p. 101	Author calls attention to fact that epidemic affected 10 per cent. of the inhabitants.
XXVI, July–Nov.	Bratsburg (county district) Norway	This embraces territory comparable to county in U. S.; most of cases along lines of communication. Very hilly country	64	2	Two instances (1) four in family, two daughters, son, and father; (2) two in family, sisters	Son in (1) had cholera nostros. In Laardal there was an epidemic of diarrhœa and vomiting, but only one child with poliomyelitis was suffering from gastro-enteritis	Leegard	32. Norsk Magazin for Laegevidenskaben, 1901	The subdivisions indicate definite districts of several square miles in area which are under the supervision of a physician especially appointed by the government. There are two families reported, each of eight children, in each of which only one child was afflicted. In 45 of the cases the diagnosis was positive, some doubt of diagnosis in the remainder. 1903–1905 no cases recorded in Bratsburg. Most of children perfectly well when attacked.
	Skien	.....	9						
	Bamble	.....	1						
	Dirangedal	.....	10						
	Hollen	.....	6						
	Ulefoss	.....	9						
	Bö	.....	4						
	Koiteseid	.....	8						
	Laardal	.....	17						
			64						
XXVII, June–July	Thuringia	Small district	5	....	.....	.....	Briegleb	33. Uber die Frage der infektiosen Natur der Ac. Polio., 1890	Cases seen in Poliklinik. No cases reported here before.
XXVIII, 1900 June–Sept.	Gloucester, Mass.	Village; radius 4 miles; almost surrounded by water; parts are high; solid rock underlies whole of it. Hygiene good	32	1	.....	.....	Painter, C.	34. Boston Med. and Surg. Jour., vol. cxlvii, p. 633	Special interest in a group of 12 cases "occurring around periphery of a cemetery."

Number of epidemic, year, and season.	Place.	Topography and hygienic surroundings.	No. of cases.	Deaths	More than 1 in family.	Relation to other diseases.	Author.	Reference.	Remarks.
XXIX, 1901 May and June	San Francisco and vicinity, Cal.	City and country. Humidity greater and less sunshine than for fifteen years previous. Locality played no part	55	....	No instance. One instance of second youngest in family of 9 children only one afflicted	.....	Woods, A.	35. Occidental Med. Times, vol xvii, p. 77	Largest number were in San Francisco and vicinity, also a few cases reported entire length of state, seaboard, mountains, valleys. Thirty of these cases seen in San Francisco clinics. Unauthentic report of 25 more cases in the state.
XXX, 1903 March–Sept.	Parma, Italy	City and country, all classes	26	....	.....	Three cases had gastro-enteritis	Lorenzelli, A.	36. La Pediatria, 1904, p. 428	Very brief report.
XXXI, 1904 March–April	Brisbane, Australia	Hygiene: large number of cases outpatients at hospitals notoriously "ill-nourished and ill-fed"	108	4	Not common to find more than one	Epidemic preceded by severe epidemic of influenza and extraordinary outbreak of mumps	Ham, B.	37. Australasian Med. Gaz., 1905 vol. xxiv, p. 193	Author calls attention to the fact that formalin was common in milk supply of Brisbane, and records an instance of an adult who was suddenly attacked with paralysis in several limbs after swallowing a small amount of formalin.
1903–1906	Norway	Includes practically all of Norway	....	....	.....	.....	Harbitz, F. Scheel, O.	38. Jour. Amer. Med. Assoc., 1907, vol. xlix, No. 17, Oct. 26	For special articles see description under each year.
1903	.....	.....	18	6					
1904	.....	.....	61	12					
1905	.....	.....	719	111					
1906	.....	.....	334	34					
XXXII, 1903 Oct.–Dec.	Hadeland and Land	.....	19	4	.....	.....	Giersvold, M.	39. Norsk Mag. for Laegevidenskaben, 1905, vol. lxvi	No description of epidemic given.
XXXIII*a*, 1904 June–Oct.	Hvaler	Includes several scattered towns. Majority of cases in Fredrikshald (city), others in country about	41	6	No instances, but four cases in one house. Onset Aug. 6, 14, 22. and Oct. 4	No other diseases recorded	Naunestadt	40. Norsk Mag. for Laege., 1906 vol. lxvii, p. 409	July–Aug. 30 cases. Epidemic seemed to spread from place to place. Cases scattered over entire city of Fredrickshald; only one street in which there were two cases.

XXXIII*b*, 1904 Sept.–Nov.	Aafjorden	District of a number of sq. miles	20	6	.....	.....	Platou, E.	41. Tidsskrift for Norske Laegeforenning, 1905, No. 17, vol. xxv, p. 601	
XXXIV, 1905	Norway. Widely scattered over country (See map)	Hygienic surroundings very poor in many epidemic districts. Many cases occurred on islands along the west coast. Here houses are overcrowded. Most severe cases occurred where there was most squalor	436	69	.....	.....	Geirsvold, M.	42. Norsk Magasin for Laegevidenskaben, 1905, vol. lxvi, p. 1280	
June–Sept. (July–Aug., 53)	S. Drontheim	.....	139	20	Four instances: in two families three in each; in the third, four; in the fourth, two				
	N. Drontheim	.....	81	21					
	Nordlands	.....	84	8					
	Tromsö	.....	14	None					
	Finmarkens	.....	2	"					
	Romsdal	.....	12	"					
	Hedemarkens	.....	17	4					
	Kristiano	.....	6	1					
	Buskerud	.....	26	3					
	Smaalenes	.....	18	7					
	Akershus	.....	11	1					
	Kristiana	.....	26	4					
			436	69					
	Norway Districts not specified	.....	283	42	.....	.....	Harbitz and Scheel	43. Jour. Amer. Med. Assoc., Oct. 26, 1907, p. 1420	These cases mentioned by Harbitz and Scheel as reported to State Board of Health. Locality not mentioned. These with districts specified make a total for Norway 1905 of 719 cases; 111 deaths.
		Total	719	111					
XXXV, 1906	Norway	.....	334	34	.....	.....	Harbitz and Scheel	44. Jour. Amer. Med. Assoc., Oct. 26, 1907, p. 420	Cases reported to State Board of Health with no details.

Three servant girls living in different houses returned together to their home. While there, and shortly after their arrival, all three came down with acute poliomyelitis (No. XXXIV).

A nursemaid who had taken care of a case of acute poliomyelitis went to another child in a different town. Fourteen days later the second child was attacked with the disease (No. XXXIII *b*).

A grandmother visited a child suffering from acute poliomyelitis. Thirty-six hours after her return to her own grandchild it was attacked (No. V).

Conclusions. The occurrence of epidemics and the relation of certain groups of cases to one another in these epidemics place beyond question the statement that acute poliomyelitis is an infectious disease. Whether we can go farther and state that the disease is communicable is an open question. After carefully considering all the evidence brought together in this paper, we cannot resist the conclusion that the disease is communicable, although only to a very slight degree, one of the most striking facts being the development of the second cases within ten days after possible exposure. Positive statements, however, must be deferred until the discovery of the infectious agent.

The preceding table gives the principal facts regarding the epidemics collected, together with the references to the literature.

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SUPPURATIVE PHLEGMONOUS GASTRITIS.

WITH THE REPORT OF A SUCCESSFUL LAPAROTOMY (PROBABLY THE FIRST) IN THE TREATMENT OF A CASE.

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Suppurative phlegmonous inflammation of the stomach wall is a condition rarely encountered by clinicians of even great experience. Probably the whole of medical literature does not contain reports of cases exceeding seventy-five in number. Several writers mention the first description of phlegmonous gastritis as having

been made by Borel (Opera) in 1656. It is claimed, this description was of the circumscribed variety, while mention of the diffuse form of the disease was not made until Cruveilhier described it so graphically in 1861. Leith, who wrote the classical production that appears in Allbutt's System of Medicine (1907), states that the first mention of the circumscribed variety was made in 1620, by Varandaeus (Tractatus de Morbis Ventriculi). Mayo Robson and Moynihan have published nearly all the cases that could be found in literature, and I have enough more scattering reports of cases, made before and since their reports were published, to bring the number of suppurative cases close to 75. But those authors have written upon the general subject of phlegmonous gastritis without regard to the presence or absence of pus. In their table of 85 cases but 63 have been proved to be of the suppurative variety of the disease. Other authors have treated the subject in this broad manner, which, after all, is probably best, except from the standpoint of treatment. Even in this, should surgical means be instituted, necessity for careful distinction would not exist, particularly as pre-operative diagnosis heretofore has practically been impossible.

Synonyms. Various titles, each supported by reasons sufficiently logical for its existence, have been employed in descriptions of this pathological condition or reports of cases observed. Among these may be mentioned acute suppurative gastritis, gastritis submucosa, employed by Dittrich, Klebs, and others; phlegmon ventriculi, or gastritis phlegmonosa, by Lebert and Bamberger; linitis plastica et suppurativa, by Brinton; gastrité interstitielle suppurative, by Auvray; and submucous suppurative phlegmon, by Krause and others. A considerable number of French observers speak of it as linite phlegmoneuse. Robson and Moynihan regard phlegmonous gastritis as the most apt term.

Varieties. Of phlegmonous gastritis two distinct anatomical varieties are observed, the circumscribed and the diffuse. Pathologically and symptomatically they might be contrasted, although operation before or after death has probably been required for diagnosis in every case reported. In no instance has a diagnosis before operation or death been authenticated, although it is claimed it was made in one of Chvostek's cases and by Dörbeck and McCaskey. In one case (Callow's) the patient vomited a pint of pus in the presence of the surgeon and pus was found in the stools before death. In some cases, however (Deininger, Glax, Beckler, Kirchmann, and Rubner), pus is said to have poured into the stomach or neighboring organ from a circumscribed abscess in the wall, and recovery to have followed. Cicatrices found in the stomach wall have been attributed by Leube, Oser, and others to the rupture of such abscesses, but this conclusion in the light of our knowledge of the disease must be regarded as purely conjectural. The diffuse form is the most common. Robson and Moynihan found in 85

cases they studied that the diffuse form was present in 63 and the circumscribed in but 11 cases.

COMPLICATIONS. The complications of this disease are carcinoma of the stomach and peritonitis. It is not necessary to add that either of them would somewhat lessen the probability of recovery were such result probable.

PATHOLOGICAL ANATOMY. The stomach wall is invariably thickened, in some cases to three-fourths of an inch. This thickening is most marked near the pylorus. In my case this fact was emphatic. The mucosa is usually smooth, having petechial and necrotic areas. In some instances small sieve-like apertures, through which pus exudes, are found. The submucosa becomes infiltrated with pus to a greater extent in the diffuse than in the circumscribed form and from the cut section of the stomach wall pus exudes under pressure. In the circumscribed form the pus may be localized in one large abscess or in several small ones. The muscular coats sooner or later become involved by the process and become infiltrated with pus. The serous coat may not escape, and perforative peritonitis results. This process is so rapid that it is practically never limited by adhesions, but becomes rapidly general. Thrombosis of the veins of the liver, lungs, and stomach may be present and acute pleurisy has been observed.

ETIOLOGY. The disease is purely one of acute virulent infection. The most frequently met microörganism is the one always present in phlegmonous inflammation—the streptococcus. The colon bacillus, the staphylococcus, and other organisms are not uncommon invaders. The gas bacillus was probably present in a few cases. Mixed infection appears to be quite the rule rather than the exception. The disease may arise suddenly and primarily in perfect health, with no preceding malady, constituting the so-called idiopathic variety, which is by far the most frequent, or it may be a sequel of some chronic or slow form of infection by metastasis or result from recent or remote trauma. Cancer of the stomach and of the œsophagus are not uncommon precursors. Osler mentions having seen the disease in two cases of gastric carcinoma. It is found as a complication of puerperal sepsis and typhus fever. Leith conveniently classifies the etiology of the disease under the following six heads: (1) Sex; (2) age; (3) alcoholic excesses; (4) dietetic errors; (5) injury; and (6) blood poisoning. In the cases, numbering about 70, in which the sex is given, the male sex has been attacked in about 80 per cent. Leube found that, of 26 cases, but 5 of them occurred in women.

No age seems exempt from this disease. Hun's case, which occurred in a girl, aged ten years, is the youngest I found recorded. Leith found, in 65 cases, that 5 occurred between the ages of ten and twenty years, 18 between twenty and thirty years, 10 between thirty and forty years, 13 between forty and fifty years, 7 between

fifty and sixty years, 7 between sixty and seventy years, and 4 between seventy and eighty years.

The oldest was eighty-five and the youngest ten years. This is somewhat at variance with the table of Glax, who classified 34 cases as follows: 4 occurred between the ages of ten and twenty years, 8 between twenty and thirty years, 4 between thirty and forty years, 7 between forty and fifty years, 4 between fifty and sixty years, none between sixty and seventy years, and 7 between seventy and seventy-six years.

Leith's statement that it is most frequent in early adult and middle life seems practically supported by the recorded cases, although, in half as many cases studied, Glax found those of extreme old age —seventy to seventy-six years—frequently attacked. Alcoholic excess appears to have had a causal relation in about one-fourth of the cases, although many writers believe it causes the disease in about half the cases. Certain it is that but a very small fractional part of 1 per cent. of people addicted to alcoholic excess have had this disease. Dietetic error just preceding the sudden onset of an attack is recorded in many instances. My case had such a history. Many histories show that great indulgence in eating as well as in drinking was followed by what was considered as acute indigestion, accompanied by vomiting of undigested food and perhaps bile, that soon proved, usually by necropsy, to be this disease. A few cases have been thought to have resulted from traumatism to the epigastrium. This relation in some cases seems quite remote. Hopkins reports one case in which, four years before an attack of this disease, the victim, a man, was jammed between the bumpers of cars. As a sequel of gastrostomy for gastric troubles it has been noted in a few instances. Silcock reports a case operated on by Mr. Howard Page for œsophageal stricture that had been produced by an epithelioma. The attack came on twenty-one days after the operation, and in six days proved fatal. Some writers have illogically concluded that ulcer must be the usual cause inasmuch as the inflammation is most noticeable near the pylorus, as is the ulcer. Various poisons and drugs, such as iodide of potassium and oxalic acid, have been blamed as etiological factors.

It is by no means clear whether in the idiopathic cases the infection comes from the gastric mucosa or through the blood channels. One would reasonably infer that if through the blood, other localities would be likely to exhibit similar manifestations. Whether excessive amounts of hydrochloric acid or trypsin may become deleterious to the gastric mucosa is not proved. To consider this disease as a severe type of gastric erysipelas would seem to be the most rational conclusion and to offer the best idea of the mode of invasion. This is a grave form of inflammation, and we know in severe types of erysipelas pus is formed. Whether minute abrasions are present in the mucosa, affording ingress of microörganisms, we do not know.

In the careful examinations made of the stomachs removed at necropsies the mucosa has been found, as a rule, practically normal, although petechial and necrotic areas are mentioned. Robson and Moynihan state there is probably always some abrasion. In my case a hurried examination revealed merely a much reddened mucosa, attributed to three days of almost constant vomiting.

SYMPTOMATOLOGY. *The Diffuse Form.* This disease has no special characteristic symptoms, and from its extremely violent and abrupt beginning it is nearly always diagnosticated and treated as acute indigestion or acute gastritis for the first two or three days. A quite common history is that of perfect health, a very hearty meal of some specially liked food, followed in a few hours by intense pain in the upper half of the abdomen and vomiting of undigested food, stained with bile. Diarrhœa or constipation may be noted, the latter ofttimes following the former. Chills, fever, meteorism, great thirst and hunger, delirium, and coma commonly supervene, and death is almost inevitable. Leith found in his analysis of 85 cases that pain was present in 75 per cent. of the cases, sometimes preceded by a chill or rigor. It generally appeared with more or less suddenness on the first day and varied from a mere sense of discomfort or weight in the epigastrium to violent pains of a cutting or burning kind. Sometimes it did not appear until the second, third, or fourth day, and usually increased in severity. It was mostly continuous, being rarely paroxysmal and rarely subsiding for any length of time. It was nearly always localized at first to the epigastric region, spreading either slowly or suddenly to the rest of the abdomen with the onset of general peritonitis. As a rule, pressure increases the pain.

Vomiting is nearly always present. In Leube's collection there was but one case free from it, and in that one nausea was present. Vomiting is usually frequently repeated and continues to the end. The vomited matter, after undigested food, is at first watery and contains alimentary matter and mucus, soon becoming tinged with bile. In two cases pus was vomited. Jaundice was present in 16 per cent. of the cases collected by Leith. In most cases fever, varying from 99° to 104° F., is present.

The pulse, full at first, becomes very small, weak, and thready, later irregular. Hiccough is a common symptom. Restlessness and and anxiety, beginning early, are soon followed by wandering speech and delirium. Usually coma and collapse precede death.

The Circumscribed Form. The symptoms are nearly the same as in the diffuse form of the disease, although the localized pain increased by pressure and the increased epigastric resistance are more marked. The duration of the disease is more prolonged and great emaciation occurs. In some cases a distinct tumor in the epigastrium has been discovered. The vomited matter may contain pus either in large quantity, as in Callow's case, or in such small amounts as to escape notice.

DIAGNOSIS. The sudden onset, the localized pain increased by pressure, and the sense of increased pressure in the epigastrium, together with the distressing vomiting of materials as mentioned, the chills, fever, pulse changes, and general aspect of the patient, the increasing severity of the condition, particularly if peritonitis ensue, suggest suppurative phlegmonous gastritis. If in addition a tumor appears in the vicinity of the stomach the presumption is stronger, and yet stronger if pus be vomited. With all these the diagnosis cannot be positive. It has to be differentiated from perigastritis, from ulcer of the stomach, suppurative cholecystitis with gall-stones, hepatic abscess, acute pancreatitis, and poisoning from caustics. It is quite evident this will, in most cases, be impossible. Examination of the blood has not been sufficiently practised to afford assistance; in but two cases, according to Boas, has the blood been examined. In Mintz's case he found poikilocytosis and in Lengemann's the leukocyte count was 30,400. If pus be present the proportion of leukocytes would probably be increased.

PROGNOSIS. This is exceedingly unfavorable in the diffuse variety. But two cases have been known to recover. In the circumscribed form a few have been reported in which rupture of the abscess into the stomach has occurred and recovery followed. These must be considered as possible errors in diagnosis. In the diffuse form the duration is from one to seven days. In the circumscribed it is probably longer.

TREATMENT. With the exception of four instances, none other than symptomatic has been employed for the diffuse variety. The great progress made in surgery of the epigastric region, however, encourages the more frequent employment of exploration by laparotomy. Perhaps by this measure incision and drainage will prove beneficial. Certainly, in a positively fatal condition the employment of new forms of treatment are to be encouraged. Whether serum treatment would be of avail has not been answered owing to failure in the diagnosis and employment of the serum. In the circumscribed form little better has been accomplished.

In the case reported by Leith exploratory laparotomy was done and the peritoneal cavity washed out, as considerable peritonitis was present. The stomach wall was not invaded, and the patient died in collapse seven hours later. The necropsy failed to reveal pus in the stomach wall.

In another reported by Robson and Moynihan a gastric ulcer had reoded the pancreas and an abscess of that organ had burst into the stomach, causing acute gastritis and severe vomiting with impending death. Posterior gastro-enterostomy was followed by recovery. In another case of non-suppurative phlegmonous gastritis the same operation was followed by death. No. 80 of Robson and Moynihan's table is von Miculicz's case of non-suppurative circumscribed inflammation of the stomach wall; no pus was present. The patient was

a male, aged eighteen years, with a clinical picture of perforative gartric ulcer. Localized peritonitis was present. The anterior wall of the stomach was much thickened, rigid, and covered with fibrinous layers. The inflammatory focus in the stomach wall was uniformly light red and œdematous and not enclosed by adhesions. It was about the size of the palm of the hand, and within were two yellowish-gray maculæ of irregular border, but about the size of a "mark piece" (coin). No perforation was found. Repeated saline irrigation was followed by an iodoform gauze plugging over the involved area, which had not been opened, and three sterile gauze tampons were introduced into the peritoneal cavity. Recovery followed.

It is thus evident that down to the report of my case (herewith), no case of suppurative phlegmonous gastritis has been operated upon. The four cases cited, however, have a very strong relation to the surgical treatment of the suppurative form of the disease. It would seem, and more particularly from these cases, that opportunity for drainage by abdominal section and external drainage with or without gastric incision is necessary. Gastrostomy or gastro-enterostomy seems to be strongly indicated, particularly as the pyloric end of the stomach is usually most involved. In my case the pylorus was completely obstructed. Gastro-enterostomy would afford drainage of the stomach into the intestine, and incision into the submucous coat with adequate technique would afford exit for pus and relieve tension. Robson and Moynihan recommend in mild terms gastrostomy or gastro-enterostomy in acute diffuse phlegmonous gastritis, and in the circumscribed form they state "opening and drainage of the abscess would be advisable."

The history of my case is as follows:

Circumscribed suppurative phlegmonous gastritis; gastrostomy; complicated by pregnancy at six months and abortion; recovery.

Mrs. T., white, aged thirty-six years, who had had seven children, followed in 1895 by a miscarriage, was brought in an ambulance to the Columbia Hospital for Women, late on the night of October 6, 1907, by her physician Dr. John S. Dorsey. She had suffered from pain in the epigastric region for several years, which was usually relieved by taking food. Her last menstrual period occurred April 13, 1907, and she considered herself pregnant. The history of this illness as given by Dr. Dorsey is about as follows: October 3 she ate heartily of boiled cabbage for dinner and crabs late at night. In the night she was attacked by severe pain in the region of the stomach. Dr. Dorsey was called and gave morphine for pain. The following day the pain continued and vomiting set in. An attempt to move the bowels by enemas and cathartics was unavailing. The temperature was elevated, ranging from 99.5° to 101.5° F., the pulse rapid and weak. The next day croton oil was employed by the mouth, but the bowels failed to respond. The various remedies at the command

of Dr. Dorsey were not effective in relieving the pain, constipation, and vomiting. The vomited material was first solid and partially digested food. Later it was watery and frothy, changing to dark green. She was so enfeebled and appeared to be so very ill that he secured an ambulance and took her to the hospital Sunday night, as already mentioned. No chill or sweat was experienced. I saw her about eleven o'clock that night, she having reached the hospital a few minutes earlier. At that time her pulse was thready and her countenance anxious in appearance. On examination on the anesthesia carriage I discovered the uterus extended to an inch above the umbilicus, and the epigastrium was distended, exquisitely tender, and tympanitic. She was promptly anesthetized, and in the presence of Dr. Wallace Neff and Dr. Dorsey, an incision in the median line above the uterus was made. The intestinal loops were found congested, but non-adherent. The stomach was palpated. It was found to be fully three-fourths of an inch thick at the middle of the greater curvature, gradually thinning toward the cardiac end. In the pyloric end and in front was a mass nearly the size of a man's fist that was soft although not doughy to touch. This gradually thinned out toward the middle of the stomach. The stomach was opened at about its middle by a longitudinal incision about three inches long and the mucosa inspected. The lumen of the pylorus would not permit the entrance or engagement of the tip of my little finger. More definitely to determine the nature of the enlargement, a separate short incision was made over it when the nature of its contents was manifest. Gauze was packed around it and it was opened, and two or three ounces of grayish pus escaped. The long incision was closed and the pus cavity wiped out. A rubber tube was tightly sutured into it and brought out of the abdomen. A light gauze drain was packed about it. The patient was fed by the rectum for twenty-one days. Five days after operation liquids were given by the mouth, as salt solution by hypodermoclysis and liquids by the rectum did not quench her ravenous thirst. The following day contents of the stomach came through the wound. A few days later solid food was given and the tube removed. Stomach contents ceased escaping in a few days. On the eighth day with little effort she aborted, the fœtus living three hours. With the exception of infection of the abdominal incision, which required re-suturing, she has made an uninterrupted recovery.

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GALLOP RHYTHM OF THE HEART.

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Gallop rhythm of the heart is not a rare clinical phenomenon, but it has been variously interpreted, and unanimity of opinion has not been reached in regard to its cause and significance. In fact, the mechanism of the production of all heart tones, both normal and abnormal, is difficult to determine, as several possible tone-producing factors are always present. Muscular contraction, the passive vibration of heart walls and valves, and the movements of columns of blood must all be considered as possibly sound-producing.

The studies which will be described in this paper were made from only those forms of gallop rhythm which are best heard at the apex of the heart or over the central portion of the precordium, the true gallop rhythm, and nothing will be said in regard to the minor interpolation or splitting of heart sounds, such as are frequently heard at the base of the heart, and which form the systolic type of Cuffer. Potain[1] considers this latter form, however, and defines gallop rhythm as a triple sound of the heart formed by the addition to the two normal sounds of an abnormal third sound. This abnormal third sound, which is neither a puff nor an accentuated part of a normal sound, is a sound of a beat interposed between the normal sounds in one or other of the silences. Reference will be made only to those forms of gallop rhythm in which the extra sound occurs during one part or another of diastole.

Two well-recognized forms of diastolic gallop rhythm occur. In one the extra sound closely precedes the first normal cardiac tone. In the other the extra tone occurs in the first part of diastole following the second normal cardiac tone. These forms have been designated by Potain and subsequent writers as the presystolic and the protodiastolic forms of gallop rhythm. Potain recognizes a third, a mesodiastolic form, in which the extra tone occurs in the middle of diastole. To the auscultating ear gallop rhythm occurs as a group of three sounds, usually of unequal intensity followed by a pause. Any one of the sounds may be accentuated, but usually it is either the first or the last sound of the group. The pause, as will be referred to later, may be either diastolic or systolic.

Gallop rhythm occurs in such a variety of conditions that it is difficult to draw any conclusions from a consideration of clinical data alone. The graphic method of studying the heart's beat is of distinct aid in the solution of this phenomenon of gallop rhythm. The extra sound producing gallop rhythm is usually accompanied by a shock which can be felt by palpation at the point of maximal impulse of the heart beat. This extra shock produces an effect in tracings taken from the apex beat of the heart, and gives the cardiograms a characteristic appearance. Potain,[2] the Chauveaus,[3] Brauer,[4] Kreige and Schmoll,[5] Friedrick Müller,[6] and others have used the graphic method for the study of gallop rhythm, and all are agreed as to the forms of cardiograms produced by hearts showing this phenomenon. The significance of the tracings, however, have been variously interpreted.

The accompanying tracings were taken with an apparatus similar

[1] La Semaine médicale, 1900, xx, 175. Les bruits de galop.

[2] A. Chauveau. Jour. de Phys. et de Path. gén., 1900, ii, 125. L'intersystole du coeur.

[3] H. Chauveau. Thèse de Paris, 1902, No. 315. Etude cardiographique sur la mécanisme du bruit galop. (Not read.)

[4] Verhand. des Kongresses für innere Med., 1904, xxi, 189.

[5] Zeit. f. klin. Med., 1891, xviii, 267. Ueber den Galloprhythmus des Herzens.

[6] Münch. med. Woch., 1906, liii 786. Ueber Galloprhythmus des Herzens.

to the polygraph described by Mackenzie[7] in his book on the pulse. Simultaneous tracings were made from the apex beat, the venous pulse in the neck, and the carotid artery. Synchronous points in the tracings from the various parts were marked out by measuring equal distances from the points where the marking needles were at rest.

The cardiograms obtained by this method agree very closely with those of others, and may be divided, except in one instance, into the presystolic and the protodiastolic groups. In the former a distinct wave is seen occurring just before the large wave of ventricular systole, while in the latter a wave is seen in the first part of diastole. These extra waves occur apparently synchronously with the extra sounds, and so it is fair to suppose that the two phenomena are manifestations of the same cardiac peculiarity. As has been pointed out by H. Chauveau, however, these two waves which accompany the extra sounds of both types of gallop rhythm are present in cardiograms from hearts producing normal sounds, and it is only when there is some accentuation or displacement of these normal waves that the cardiogram can be considered characteristic of gallop rhythm.

Satisfactory tracings could not be made from all the cases of gallop rhythm encountered, but in 9 cases tracings sufficiently good for study and analysis have been obtained. Of these cases, 3 showed the presystolic type, 5 showed the protodiastolic type, while 1 was of Potain's mesodiastolic type.

In the tracings obtained from the cases of presystolic gallop rhythm the most striking feature of the cardiogram is a well defined wave occurring just before the large wave caused by ventricular systole. Synchronous with it there occurs a large positive wave in the tracing taken from the venous pulse in the neck, and there can be little doubt that both these waves are dependent upon the contraction of the auricle for their formation. The arterial pulse tracing shows no corresponding wave. As the impulses forming these waves in the cardiogram and in the venous tracing occur at the same time as the extra tone of presystolic gallop rhythm, it is fair to believe that the extra tone is produced by the auricular contraction, either as a muscle tone or as a more remote effect. This belief has been disputed, however, and a number of other ideas have been advanced in explanation of gallop rhythm which exclude the auricular contraction as an essential element in the production of the extra sound.

Several of the older conceptions of the mechanism of gallop rhythm, however, do not stand in accord with recent advances in knowledge of the anatomy and physiology of the heart. For instance, asynchronous contraction of the two ventricles was formerly held as the cause of gallop rhythm, but after such careful studies of the

[7] The Pulse and the Movements of the Heart, 1902. London: Churchill & Co.

musculature of the heart as that of J. B. MacCallum,[8] who showed that the same bands of muscle encircled both ventricles, it is difficult to conceive that such asynchronous contraction is possible.

Bard[9] has recently reviewed various theories of gallop rhythm, especially those held by French investigators. His own idea of the cause of presystolic gallop rhythm is that there is a separation of two elements usually fused to form the first normal cardiac tone. He believes that the first of these elements is caused by the tension of the septum of the ventricles at the beginning of ventricular systole, and that the second element is due to the vibration of the mitral and tricuspid valves in their closure. His arguments do not seem to be very well sustained, although he mentions several reasons why other theories are unsatisfactory. Doll[10] has recently advanced the idea that the two sounds that occur instead of one at the beginning of systole in presystolic gallop rhythm are due to a double contraction of the ventricle.

Müller, on the other hand, in his excellent paper on gallop rhythm, advances the belief that presystolic gallop rhythm is due to a strengthened blood stream from the auricle to the ventricle, and he considers that the auricular contraction plays an important role in the production of this phenomenon. Johnson[11] considers that "the contraction of a dilated and especially of an hypertrophied auricle becomes sonorous, and that the first division of the double first sound in the cases under consideration is the result of auricular contraction." He thinks that this sound may be produced by (1) muscular tension; (2) impulse against the chest wall; (3) forcible impact of the blood driven forward by the auricle against the stationary blood in the ventricles. Both the right and the left auricle may be the cause of the extra sound. Exchaquet, working under Potain, came to similar conclusions, independently and at the same time as Johnson.

According to Müller, Marey believes that the extra sound is produced by the auricle sending blood into a defectively emptied ventricle. Müller considers that the extra tone may be dependent upon a delay in the time between the auricular and the ventricular contractions possibly due to lowered conductivity of the auriculoventricular bundle of His, and that when the two contractions are abnormally separated, two sounds instead of one are produced. He believes that the distinctly shortened diastole as compared to the systolic time, may be responsible for the delay, the recovery time being insufficient for the heart to regain its normal power of conducting the heart beat from one part of the heart to another. Gallop rhythm was produced by Schiff by causing an increase in the heart rate by vagus stimulation.

[8] Johns Hopkins Hospital Reports, 1902.

[9] La Semaine Médicale, 1906, xxvi, 229. Du bruit de galop de l'hypertrophie du cœur gouche; son mécanisme et sa signification clinique.

[10] Berl. klin. Woch., 1905, xlii, 1440. Weiteres zur Lehre vom echten doppeltan Herzstoss.

[11] Lancet, 1876, i, 697. Triple Pericardial Friction Sounds, and on Reduplication of the First Sound of the Heart.

The views of Potain are especially interesting. He thinks that the auricular contraction plays but a secondary part. Potain believes that the extra sound is produced at the moment when the ventricles become distended in their dilatation. The myocardium, as other muscles, is endowed with tonicity, and this tonicity is in antagonism to the influences which tend to force the blood into the ventricle during diastole. If the cardiac muscle looses its tonicity, the ventricle in dilating, arrives rapidly at a point where the fibrous resistance of the septum limits dilatation. Thus, a quick check is produced, a sudden tension, a shock, and the extra sound of gallop rhythm results. Potain believes that the combination of a strongly acting heart and fibrous changes in the heart walls, which increase the fibrous resistance of the septum, are the most favorable conditions for

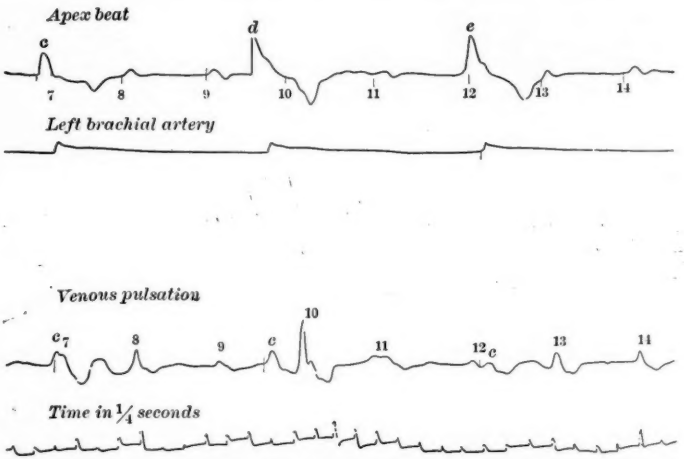

FIG. 1.—From a case of complete heart block. The waves due to the auricular contractions are marked by numbers. The letter *c* in the venous pulse tracing marks the waves that come synchronously with the carotid pulse. Ventricular systoles are marked by letters.

the production of gallop rhythm. Such a combination is not infrequent in chronic nephritis. Hypertrophy of the auricle contributes to the production of the extra tone, but Potain does not believe that the simple exaggeration of the auricular systole is sufficient for the production of a tone, as this systole has not been shown to be sound producing.

This last statement of Potain is readily disproved, however, by a study of a case of Stokes-Adams syndrome, or heart block. Here the auricles and the ventricles when the block is complete, contract independently and at very different rates. In the case from which the accompanying tracing (Fig. 1) was taken, loud booming sounds were produced by the forcible ventricular contractions, while short,

rather faint but distinct tapping sounds were heard agreeing in time with the auricular contractions, as seen in the cardiogram and the venous pulse tracing. This phenomenon has been noted by a number of recent students of heart block, and all agree that the more frequent sounds are the result of the auricular contractions. These sounds are usually considered of muscular origin.

A study of the cases of gallop rhythm that I have observed seems to show that the extra tone in presystolic gallop rhythm is not always

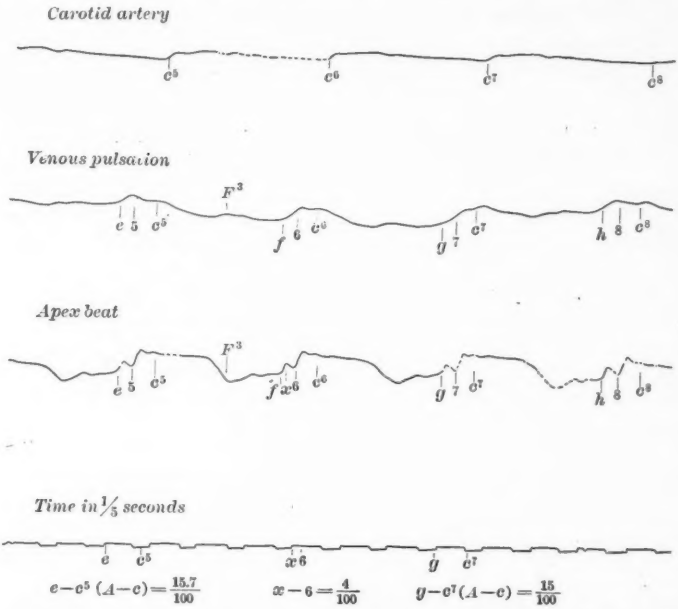

FIG. 2.—From a case of subacute or chronic nephritis. Presystolic gallop rhythm. Small letters mark the waves of auricular systoles; numbers mark the waves of ventricular systoles; the letter *c* marks the beginning of the carotid wave; *f* marks the opening of the tricuspid valve and the end of ventricular systole, as indicated by the venous pulse; and *x* marks the auricular wave crest.

produced in the same way. The cases have been divided into two groups: One group includes patients suffering from chronic nephritis, aneurysm of the descending aorta, exophthalmic goitre, and mitral stenosis; cases in which the heart was hypertrophied. The other group consists of cases of typhoid fever, usually in the height of the disease with weakly acting hearts. In both classes cardiac rapidity was seen, but the force of the heart was distinctly different. In the first group cardiograms were readily obtained, while in the cases of typhoid fever showing gallop rhythm, six or eight of which

were studied, tracings were never sufficiently good for satisfactory analysis. In the cases belonging to the first group it seems probable that the extra, presystolic sound was produced by a strongly acting auricle. In but one of the 3 cases did the relation to one another of the waves in the venous pulse tracing indicate that there was a delay in the transmission of the heart beat from the auricle to the ventricle.

The first of the tracings belonging to Group I (Fig. 2) was taken from a case of chronic or subacute nephritis. On the day the tracing was taken the pulse was about 90 per minute, the heart was enlarged

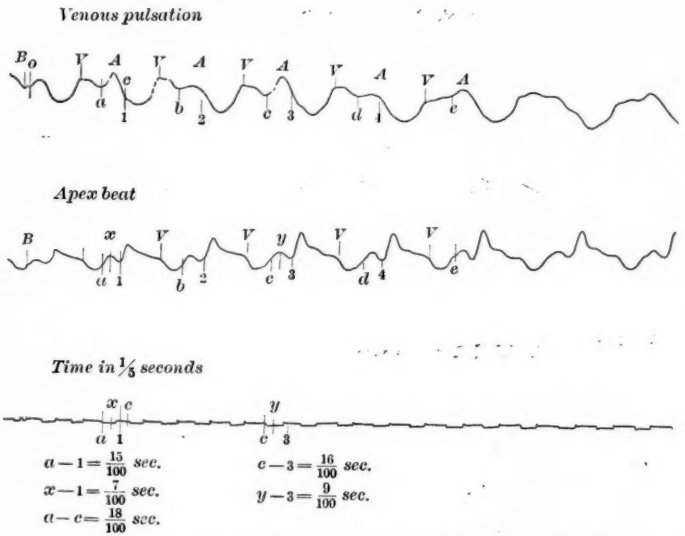

FIG. 3.—From a case of aneurysm of descending aorta. Presystolic gallop rhythm. Markings as in Fig. 2, except *V*, which marks the end of ventricular systole, as indicated by the venous pulse tracing. *x* and *y* mark the auricular wave crests.

to percussion, the apex beat was forcibly felt in the fifth space 10.5 cm. from the mid-line, and a very distinct presystolic gallop rhythm could be heard at the apex, but more distinctly and loudly over the central portion of the heart. The systolic blood pressure was 165 mm. Hg (Stanton instrument). The time from the beginning of the auricular wave in the venous pulse to the wave synchronous with the carotid wave, is found to vary from $13\frac{3}{100}$ seconds to $15\frac{1}{100}$ seconds in different cardiac cycles. (See Table I.)

The second tracing (Fig. 3) is from a case of aneurysm of the descending aorta. The gallop rhythm, presystolic in type, was very distinct and constant for months. On the day the tracing was taken,

the pulse was 112 per minute, the cardiac dulness was distinctly enlarged, and the point of maximal impulse was in the sixth space 4 cm. outside the left mammillary line. The gallop rhythm was extremely well heard over the precordium and at the apex, but it was loudest and most distinct in the third space at the left of the sternum. The tracing shows a very well marked wave in the cardiogram preceding the large ventricular wave, and accompanied by a marked venous wave. The time between the beginning of the auricular wave in the vein and the wave synchronous with the carotid wave, which is poorly seen, is never more than $\frac{18}{100}$ second.

The third tracing, which is not reproduced, was taken from a case of mitral stenosis complicated by typhoid fever. On the day the tracing was made the pulse was 110 to 112 per minute. The blood pressure three days later was, systolic 118 mm. Hg and diastolic 95 mm. Hg. Here the A-C time was lengthened, and was in most cardiac cycles $\frac{23}{100}$ second.

Müller measures the time between the auricular and the ventricular contractions by noting the time between the crest of the presystolic, or auricular wave, and the beginning of the ventricular systolic wave in the cardiogram. In all of his tracings from cases of presystolic gallop rhythm he finds this time lengthened beyond the normal, which is, according to Egren and himself, from $\frac{2.5}{100}$ to $\frac{5}{100}$ of a second. This time was from $\frac{6}{100}$ to $\frac{10}{100}$ of a second in his cases. The time from the crest of the presystolic or auricular wave to the beginning of the ventricular systolic wave in my first case was but $\frac{4}{100}$ of a second, as a rule, and was never prolonged beyond the normal limits, while in the second and third cases this time was $\frac{7}{100}$ and $\frac{6}{100}$ respectively. It is seen then that presystolic gallop rhythm may occur without a delay in transmission of the heart beat from the auricle to the ventricle. In the third case the tracing from the venous pulse indicates that a delay was present; Müller's method of measuring also showed this. But this was a case of typhoid fever complicating mitral stenosis, so that it seems to be a combination of the two classes of cases—those with the strongly acting hearts, and those cases of gallop rhythm seen during a severe febrile disease.

In the cases of presystolic gallop rhythm which have strongly acting hearts, according to Müller, hypertrophy and dilatation of the auricles are usually found postmortem. This is to be expected from the class of cases in which the phenomenon occurs. I have had the opportunity to study the heart postmortem in but one case, that from which Fig. 2 was taken. This patient died suddenly with rupture of his aneurysm. The heart was enlarged and very firm in consistency. It weighed 520 grams. The walls of all of the heart chambers were hypertrophied, but especially the right auricle which measured 3 mm. in thickness. The muscle had a solid, compact appearance, and microscopic sections from the walls of the various

parts of the heart showed rather coarse, large, well preserved muscle cells. No gross lesion was seen in the region of the auriculoventricular bundle. This portion of the heart was removed and hardened, but no microscopic study of it has been made as yet.

From a consideration of the foregoing cases it seems very probable that the extra tone of gallop rhythm may in some cases depend entirely upon increased, forcible action of hypertrophied auricles, although a delay in the transmission of the heart beat would certainly tend to accentuate the distinctness of the tone.

In regard to causes of delay in the transmission of the heart beat from the auricle to the ventricle through the auriculoventricular bundle, Aschoff [12] believes that when the heart is hypertrophied the auriculoventricular bundle may be so small relatively that it is unable to convey the impulse as quickly as it does normally. This may be a factor in the causation of gallop rhythm, especially in cases or chronic nephritis with hypertrophied hearts.

In all probability the mechanism of the extra tone of presystolic gallop rhythm heard in strongly acting hearts is similar to that of the sounds arising from the auricular contractions in heart block or Adams-Stokes syndrome, in which the sounds are best heard or often only heard in the upper part of the precordium. I believe this sound is of muscular origin, due, in gallop rhythm, to the strongly contracting auricles. For the production of the extra sound a delay in the transmission of the heart beat is not necessary. The statement of Howell,[13] that the contraction of a bloodless heart can produce a sound, has some bearing on this point.

The other class of cases of presystolic gallop rhythm, those occurring especially during the height of typhoid fever, with a weakly acting heart and with a low blood pressure, are obviously due to some cause other than increased auricular action. In these cases also the extra tone seems to arise in the auricle, but the condition of the heart muscle must be quite different from that of the first group. We know from clinical experience with this class of cases that the gallop rhythm is transitory, and usually occurs with a rapid, poorly acting, sometimes irregular heart at the height or toward the end of severe cases of febrile diseases, especially typhoid fever. There is probably present a loss of muscular tone, and perhaps conditions are such that a delay in the transmission of the heart beat is present.

No satisfactory tracings could be obtained from this class of cases, and without these it is impossible to measure the time of conduction from the auricles to the ventricles. It is possible that in the case of mitral stenosis complicated by typhoid fever, in which tracings showed a delay of transmission of the heart beat from the auricle

[12] British Medical Journal, 1906, ii, 1103. Discussion of heart block.
[13] Text-book of Physiology, 1905: Philadelphia: Saunders & Co.

to the ventricle, it was the febrile disease that caused the faulty conduction.

In the protodiastolic type of gallop rhythm the extra tone and the shock which produces a wave in the cardiogram are synchronous with the first rush of blood from the auricle into the ventricle, at the beginning of diastole when reëxpansion of the ventricle occurs. Müller believes that this form of gallop rhythm, as well as the presystolic form, is associated with an increased flow of blood from the

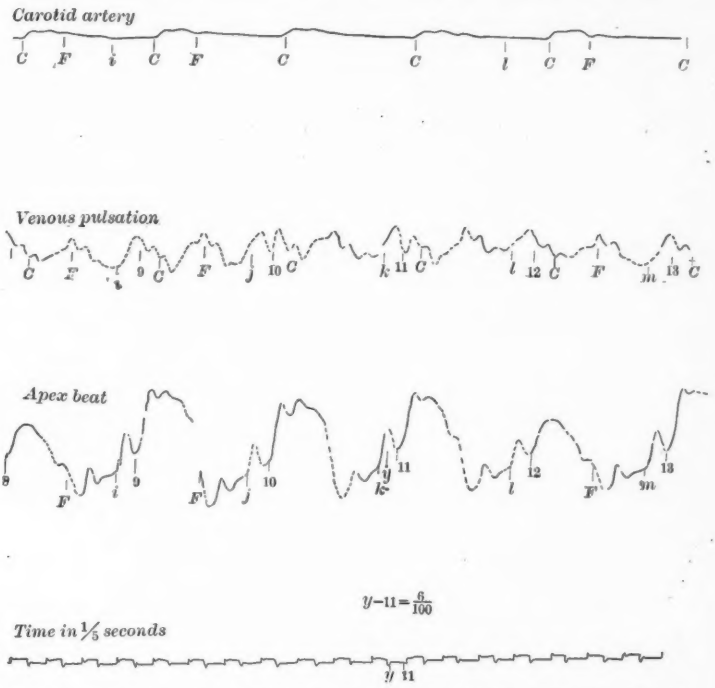

FIG. 4.—From a case of myocarditis. Protodiastolic gallop rhythm. Both the prodiastolic and the presystolic waves are well shown. Markings as in Fig. 2.

auricle to the ventricle. He has observed patients, as has Potain, in which the presystolic type of gallop rhythm went over into the protodiastolic type. Potain considers the mechanism of the protodiastolic type to be the same as that of the presystolic type. In the former, the sudden increase of tension of the ventricular walls, which he believes is the cause of the extra shock and sound, occurs earlier in diastole and accompanies the first rush of blood from the auricle, instead of late in diastole, when the auricular contraction suddenly completes the filling of the ventricle.

I have obtained satisfactory tracings from 5 cases, showing protodiastolic gallop rhythm. The first case, from which Fig. 4 was obtained, was a man of fifty, who on admission had an enlarged irregular heart, but no cardiac murmurs. Fairly well marked arterial sclerosis was present. Frequent extra systoles were observed, and the patient was considered to have chronic myocarditis. This patient had no cardiac symptoms. He had been doing heavy work, and was admitted on account of hernia. At times, but not constantly, there was heard at the apex a fairly definite protodiastolic gallop rhythm. At the time the tracing (Fig. 4) was made the heart was

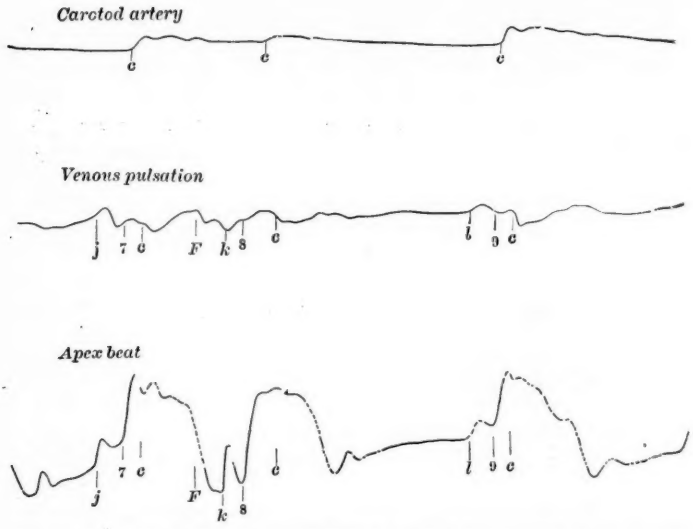

FIG. 5.—Same case as Fig. 4. An extra systole followed by a pause is shown. Protodiastolic wave is in the first part of diastole.

acting regularly. The two diastolic waves are very well seen, and from the tracing it cannot be told which form of gallop rhythm was present. However, the only extra tone that could be heard followed the second normal heart sound, in spite of the fact that a delay in transmission of the heart beat is indicated by both the method of measuring of Mackenzie[14] and of Müller. The heart was enlarged and beating forcibly. In another tracing, which showed extra systoles followed by diastolic pauses (Fig. 5), the protodiastolic wave was always associated with the beginning of diastole. The protodiastolic wave was followed by a gentle rise in the cardiogram, which ended

[14] British Medical Journal, 1906, ii, 1103. Discussion of heart block.

in a distinct wave preceding the next ventricular systole. This is a further indication that the protodiastolic wave is associated with the first rush of the blood from the auricle into the empty ventricle. It confirms an observation made by Dietrich Gerhardt and recorded by Müller.

The second case of protodiastolic gallop rhythm from which a tracing (Fig. 6) was obtained, was that of a young man, twenty-three

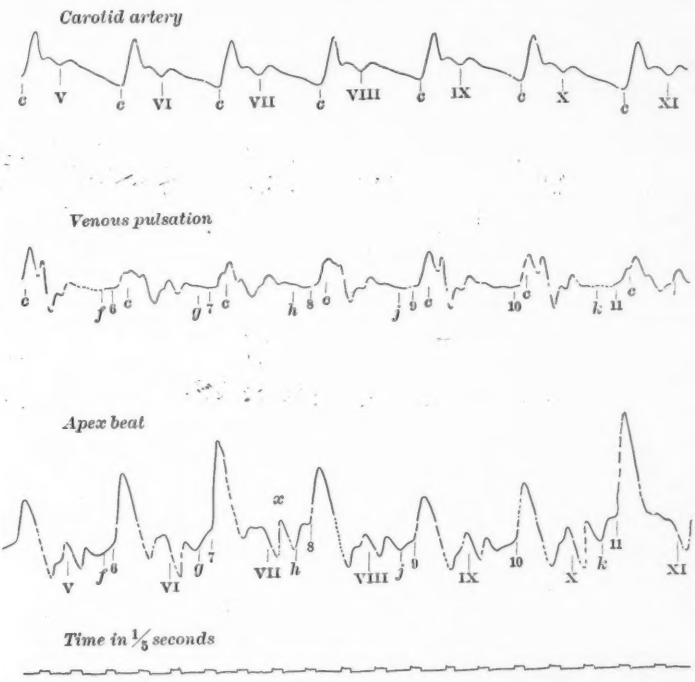

FIG. 6.—From a case of chronic endocarditis. Protodiastolic gallop rhythm. Roman numbers mark the end of systole, as indicated by the dicrotic notch of the carotid artery. Wave marked *X* is the protodiastolic wave. Other markings as in Fig. 2.

years of age, suffering from chronic endocarditis with broken compensation. There was aortic regurgitation as well as mitral regurgitation and stenosis. The blood pressure, taken several days before the tracing, showed, systolic 125 mm. Hg, and diastolic 85 mm. Hg. The heart was distinctly enlarged, and at the time the tracing was made the apex beat was in the fifth interspace 14.5 cm. from the midline. Cardiac dulness extended 4.5 cm. to the right, and 16.5 cm. to the left, of the midline. A sharp tapping impulse could be felt at

the apex which occurred soon after the completion of the apex beat. This second impulse was accompanied by a sound which somewhat confused the second normal heart tone. At this time, about one month after admission, at the apex only a systolic murmur could be heard, and this did not obscure the protodiastolic gallop rhythm that was present. In the tracing a large, sharp wave is seen in the first part of a very short diastole, and precedes a somewhat indefinite presystolic wave. The protodiastolic wave follows quite closely the

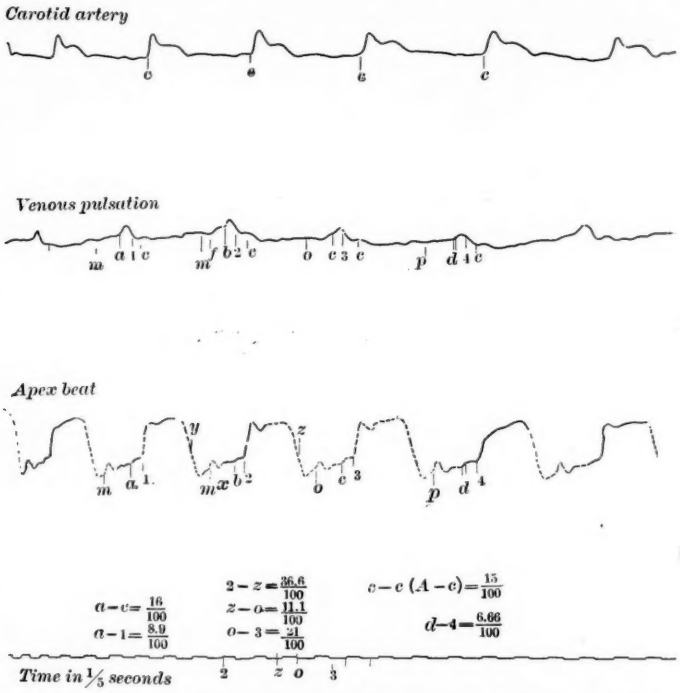

FIG. 7.—From a case of secondary anemia. Protodiastolic gallop rhythm. Markings as in Fig. 2. *m*, *m*, *o*, *p*, mark the beginning of protodiastolic waves. *Y* and *Z* mark the end of the ventricular systoles.

closure of the aortic valves, as indicated by the well marked dicrotic notch in the carotid artery, which, according to Otto Frank and others, occurs synchronously with the closure of the aortic valves. According to Müller, the reëxpansion of the ventricle comes on measurably later than the closure of the aortic valves, and so would correspond to the position of the marked protodiastolic wave. The venous pulse was quite poor, and the tracing of it at this time was not satisfactory.

The three other cases of protodiastolic gallop rhythm were all of severe anemia. They did not show as well marked protodiastolic waves as the other tracings, but in the cardiograms from all of them this wave could be made out more distinctly than in any tracings I have taken from normal hearts. The first case (Fig. 7) had severe secondary anemia. The hemoglobin was 20 per cent., and the red cells were 1,544,000 on the day the tracing was taken. The pulse was 80 per minute. The other 2 cases, the tracings from which are not reproduced, were splenic anemia and progressive pernicious anemia respectively. In the case of splenic anemia the gallop rhythm was marked and present over a period of some weeks. It diminished as the patient recovered. In the case of pernicious anemia the gallop rhythm was transient and heard only at times. In these 3 cases, the hearts were slightly enlarged and the radial pulse was of low tension.

In protodiastolic gallop rhythm, there is an extra tone closely following the normal second cardiac sound, falling in the first part of diastole, associated with a definite extra or modified wave in the cardiogram, and occurring at the time when the blood first rushes from the auricles into the empty, flaccid ventricles. The crest of this protodiastolic wave is synchronous in all of the tracings with a negative wave or dip in the venous pulse, which indicates that the blood is leaving the auricles and the adjacent veins while it is suddenly distending the ventricles, producing the characteristic wave at the apex. This point was noted by Brauer, and was confirmed by Müller's tracings.

The two forms of gallop rhythm which have been described in this paper are best heard in distinctly different parts of the precordium. While the presystolic form is best heard in the middle portion of the precordium, the protodiastolic type is best heard, and is often only heard, at the apex of the heart. This indicates that the latter form of gallop rhythm is due to an extra tone which has its origin in the ventricles rather than in the auricles.

There are two factors to be considered in attempting to determine why the blood in first entering the ventricles should produce a sound and should modify the protodiastolic wave in the cardiogram. The first factor is change in the walls of the ventricles, and the second factor is an increase in the amount or in the velocity of the flow of blood from the auricles into the ventricles. Potain lays stress upon the first and Müller upon the second factor.

In the cases I have studied, there was evidence of lack of tone of the heart muscle in all, and in the first case, at least, there was probably an increase in fibrous tissue in the heart walls. In all of the cases of protodiastolic gallop rhythm except the first there is reason to believe that there was an increase in the amount and velocity of the blood stream into the ventricles.

The regulation of the flow of the blood from the auricles into the

ventricles depends upon several factors. Goltz and Gaule and others have shown that a negative pressure may exist in the ventricles just after they go into diastole. Any abnormal increase in this negative pressure would cause the blood to rush into the ventricles more forcibly than usual. The pressure produced in the auricles by the accumulation of blood from the veins during ventricular systole, when the mitral and tricuspid valves are closed, is also a factor which controls this flow of blood. Any increase in this pressure, as is seen with the congestion that is so often present in cardiac insufficiency, would increase the amount and velocity of the blood stream from the auricles to the ventricles.

Another factor is suggested by Müller. Tracings from cases of gallop rhythm often show a distinct decrease in the diastolic time of the cardiac cycle. This decrease of the diastolic time is associated with rapid heart action, which always reduces the diastolic time relatively much more than it does the systolic time. When the diastolic time is shortened, the blood has less time to flow from the auricle to the ventricle than it has under normal conditions, and, therefore, must go more quickly. Consequently, the diastolic collapse of the heart is more sudden, and the first rush of blood from the auricle to the ventricle is more likely to cause an impression in the cardiogram and to produce an extra tone.

It seems probable, however, that the phenomenon of protodiastolic gallop rhythm is caused by a combination of circumstances which allows an increased flow of blood from the auricles into the ventricles in hearts in which there is a loss of muscular tone. As the extra sound is best heard at the apex of the heart, it is probably produced in the ventricles, and is, as Potain believes, the effect of the first part of the rush of blood from the auricles into the ventricles upon the walls of the ventricles.

The case of gallop rhythm, the type of which does not agree with either of the foregoing types (Fig. 8), was one of marked cardiac insufficiency, both valvular and muscular. The physical signs and symptoms of badly broken cardiac compensation were present, and when the tracing was taken the heart rate was 150 per minute. The first normal heart sound was loud, and was the last of a group of three which seemed equidistant from one another. The tracing shows a large extra wave in the cardiogram, even higher than that caused by the ventricular systole, and occurring in the central portion of diastole. This case would then fall in Potain's group of mesodiastolic gallop rhythm. The venous pulse was unsatisfactory and the carotid pulse produced no record, but this tracing has been interpreted, with the help of several others from the same patient, in which the venous and the arterial records were better.

It is difficult to say what factors were concerned in the production of the gallop rhythm in this case. The gallop rhythm was heard equally well at the apex of the heart and over the central portion of

the precordium. Although measurements in this case are difficult and uncertain, there was apparently a slight delay in the transmission of the heart beat, but from clinical considerations it would seem probable that the paralysis of the auricles, such as Mackenzie has observed, was present, and that the auricular contraction had but little to do with the production of the extra sounds. This case apparently resembles more closely the protodiastolic than it does the presystolic type.

If the points in the cardiograms at which the various sounds occur are determined, the cardiogram serves as an easy means for indicating in what part of the cardiac cycle the long pause comes.

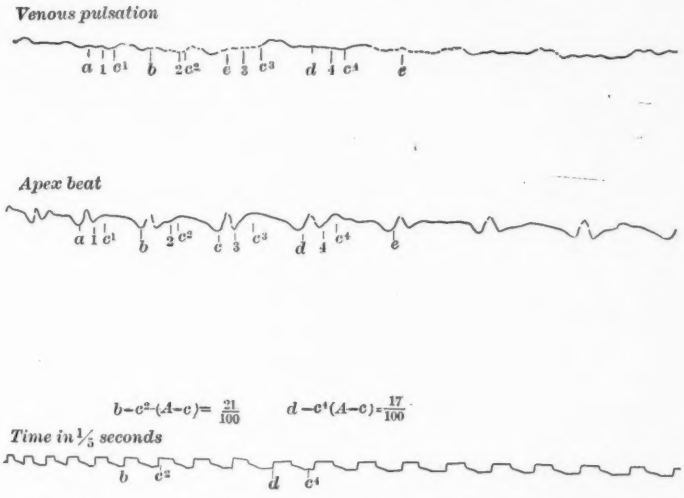

FIG. 8.—From a case of chronic endocarditis and myocarditis. Mesodiastolic gallop rhythm. Markings as in Fig. 2.

According to Howell, Marey has shown that the first sound occurs immediately after the beginning of systole, and the second immediately after the beginning of diastole of the ventricles. The second normal cardiac sound is usually considered as caused by vibrations set up by the closure of the aortic and pulmonary valves. Points in the cardiogram synchronous with the dicrotic notch in the carotid artery may, therefore, be taken as marking the time when the second normal heart sound occurs. The beginning of the wave of venrticular systole marks approximately the point at which the first heart sound occurs. The extra sounds of gallop rhythm begin in all probability with the beginning of the extra or modified wave, and continue during the upstroke of the wave.

In all of the tracings from cases of gallop rhythm in which I have measured the time between the various sounds, the longest silent period is during systole. This is shown in Table I. The first 2 cases (Figs. 2 and 3) are presystolic gallop rhythm, so that the diastolic silence lies between the second heart sound and the extra sound, while the next 3 cases (Figs. 4, 6, and 7) are protodiastolic, in which the diastolic silence lies between the extra sound and the first heart sound. In the last case (Fig. 8) the beginning of the extra sound lies almost midway between the second and the first heart sounds. It must be borne in mind, then, when listening to gallop rhythm, that the extra sound is usually the middle one of the group of three, and that the last sound of the group, which is often accentuated, is very likely the first normal cardiac sound.

SUMMARY. Gallop rhythm of the heart is a fairly frequent clinical phenomenon, which consists in the presence of a group of three cardiac tones, none of which are murmurs. It occurs under variable clinical conditions. That form of gallop rhythm which is best heard at the apex, or over the central part of the precordium, may be divided into the presystolic, protodiastolic, and mesodiastolic types, depending on whether the extra tone falls at the end, at the beginning, or in the middle of diastole. Each form is associated with a characteristic cardiogram. There are a number of factors which probably combine in various ways to produce the various forms of gallop rhythm.

Presystolic gallop rhythm is heard in two classes of cases. It is heard in strongly acting hearts in which a muscle sound produced by a strongly acting, hypertrophied auricle is probably the cause of the extra tone; and it is also heard in weak, rapidly acting hearts at the height of acute febrile diseases, at which time there is possibly a delay in the conduction of the heart beat from the auricles to the ventricles. Under these circumstances the sound produced during the contraction of the auricles becomes distinguishable from that produced during the contraction of the ventricles. In both classes of cases, the extra tone seems to be produced in the auricle rather than in the ventricle. Protodiastolic and mesodiastolic gallop rhythm are caused by the production of an extra tone in the ventricles. The factors that probably combine to produce this extra tone are an increase in the amount and velocity of the flow of blood from the auricles into the empty ventricles and a loss of tone of the heart muscle of the ventricles. The longer silent period in cases of gallop rhythm does not usually occur during diastole, but is usually a systolic silence.

Table I shows the time relations in the cardiograms between the points where the two normal heart sounds and the extra sound of the gallop rhythm occur. It shows that the longest distance between any two sounds always falls at the time of ventricular systole.

TABLE I.—TIME IN HUNDREDTHS OF SECONDS.

No. of Fig.	Time from first to second cadiac sounds.	Time from second sound to extra sound.	Time from extra sound to first sound.	Variety of gallop rhythm.
II	34	28	6.6	Presystolic.
III	28.5	15	10	Presystolic.
IV	60	10	28	Protodiastolic.
VI	33	6.6	20	Protodiastolic.
VII	36.6	11	21	Protodiastolic.
VIII	26.4	6.6	10	Mesodiastolic.

Table II shows the results of the two methods of measuring the time of conduction of the heart beat from the auricles to the ventricles.

TABLE II.—TIME IN HUNDREDTHS OF SECONDS.

Name or Number.	I.	II.	Remarks.
Egren		2.5–4	Normal.
Müller		3–5	Normal.
Author	12–20	2.5–6	Normal.
Erlanger	14	4.5	Exposed heart.
1.	15	4.4	Nephritis. Presystolic.
2.	18	7	Aneurysm. Presystolic.
3.	23	6	Mitral stenosis and typhoid fever. Presystolic.
4.	24	7.3	Myocarditis. Protodiastolic. Both waves marked.
5.	20	5–6.7	Chronic endocarditis. Protodiastolic.
6.	16	4	Anæmia. Protodiastolic.
7.	14–18	3.6	Anæmia. Protodiastolic.
8.	11	4	Pernicious anæmia. Protodiastolic.
9.	17–21	5	Myocarditis and endocarditis. Mesodiastolic.

In Table II, column I shows the time from the beginning of the auricular wave to the beginning of the wave that is synchronous with the carotid arterial pulse in the venous pulse tracing; the A-C time of Mackenzie. Column II shows the time from the presystolic wave crest to the beginning of ventricular systole.

The figures of Erlanger are taken from his recently published tracings taken from a practically exposed heart upon which receiving cups could be put over the left auricle and ventricle.[15]

[15] Since this paper was written that of J. Pawinski, Die Entstehung und klinische Bedeutung des Galloprhythmus des Herzens (Zeitschrift für klinische Medizin, 1907, lxiv, 70), has come to hand. Here will be found, besides the author's views, an extensive discussion of the literature on gallop rhythm.

TOXEMIA FROM THE STANDPOINT OF PERVERTED METALBOLISM.

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This subject of toxemia has become, in recent years, of great importance. So varied are the conditions which, owing to vague etiology, have been classified as toxemic or toxic in character, that a brief discussion of a few of them seems not ill-timed. I cannot go into detail regarding many of these conditions, but must limit myself to these better known, leaving those of indefinite etiology with mere mention.

Definition. So uncertain have been the ideas regarding toxemia that it seems advisable, in the beginning, to define what is meant by this term. Toxemia is a condition characterized by the overloading of the blood with normal or abnormal products of food or tissue metabolism. This condition, therefore, is purely endogenous in character, and is sharply separated from those conditions associated with toxic symptoms due to exogenous products as well as from those toxemic states arising in the course of infectious diseases. Of course, the toxemia related to abnormal intestinal activity may be due to bacterial action to some extent, but the bacteria concerned in such processes are normal habitants of the intestinal tract, and may, therefore, be considered aside from those producing the acute infections. Toxins elaborated by the activity of specific microörganisms upon the various classes of tissue of the body, cause, oftentimes, such an intense poisoning of the system that death results, but this specific toxemia is not under discussion in this paper. Time will not permit a differentiation, both chemical and pathological, of these two types of toxemia; I can do no more than refer to the fact that in all infectious diseases specific toxic products are formed, the influence of which depends upon the resistance of the system as characterized by the presence and activity of antibodies, such as antihemolysins, antitoxins, anti-agglutinins, opsonins, etc. These subjects are becoming of prime importance in the study of infections, but are beyond the scope of this paper.

It should be further remembered that excessive normal or abnormal activity of one organ may so influence the activity of other organs that a toxemia may follow as a result of perverted secondary metabolism. The close relation or coördination of the various tissues of the body has been well treated by Starling in his assumption of the various "hormones."

Perverted Metabolism. Accepting, then, that the toxemia under discussion is endogenous in character, is usually non-bacterial,

and is influenced by the inter-relations of the many organs of the body, is there any basis for the belief that it is due to perverted metabolic activity of any organ or group of organs? It is more or less common, in these days, to hear of intestinal, hepatic, renal, thyroid, orchitic, and other toxemias, as well as of those conditions occasionally accompanying more or less physiological states, such as pregnancy. It is evident, therefore, that such conditions are associated, in the minds of the profession, with abnormal activity of the organ in question. It is reasonable to suppose, and definite proof can be given, that abnormal activity, that is, perverted metabolism, of any organ results in the overloading of the blood with products which may, *per se*, lead to various symptoms of the toxemic type, or may so influence the activity of other organs that abnormal relations obtain. Moreover, the activities of many organs, depending as they do on the presence of certain substances elaborated by other organs, and passed by them into the blood stream, are influenced to abnormal activity by their absence, due to disease or to perverted metabolism of the coördinated organs. It is necessary, in support of this view, only to cite the influence of the thyroid, ovary, testicle, pancreas, suprarenal, and hypophysis on the general body functions. Remove them and the results are well known.

Intestinal Toxemia. In the study of this condition we have to consider several factors. It is evident that the activity of the intestinal juices is dependent on the quality and quantity of the food introduced, the quality and quantity of the intestinal juices, the power of absorption, and the motility of the intestine. Normally, no great variation in the decomposition processes, both those due to the intestinal ferments and those due to intestinal bacteria, is observed. Yet any abnormality in any of the factors above mentioned will lead to markedly abnormal decomposition processes. Thus the intake of an excessive amount of food or drink leads first to disturbance of the gastric functions, as shown by the symptoms of nausea and vomiting, and later to marked intestinal disorder, as evidenced by the symptoms of enteritis. While such disturbances do not, necessarily, lead to general symptoms, yet the common complaint of weakness, headache, rapid, weak pulse, etc., show that a general influence is present. Moreover, a direct effect upon the intestinal activity is observed after the intake of a large amount of food. The digestive powers of the juices are pushed to the limit to take care of the excess, but unless abnormal motility of the bowels is present, this excess cannot be handled. We thus observe an effort on the part of the bowel to overcome these effects. Diarrhœa, under these conditions, is a conservative process, since without it the digestive juices cease to act, according to the law that an accumulation of the products of activity of an enzyme will retard or prevent further activity. In case the motility of the bowel is normal, the food remains in a partly digested state, and is then subject to the activity

of the bacterial flora of the intestines. Such latter activity is not the same as is that of the digestive juices, except to a certain degree, and abnormal products are formed. The ordinary processes which occur in the bowel abnormally are fermentation of the carbohydrates, putrefaction of the proteins, and conversion of the fats to lower fatty acids. Normally fermentation occurs in the lower parts of the small intestine, while the putrefactive processes take place, almost exclusively, in the large bowel. Occasionally we find these latter changes in the small intestine, and in such cases the decomposition products, as found in the urine, are much increased, owing to the greater absorptive power of the small bowel. It is clear that an abnormal condition of the digestive juices will lead to a lessened digestive, and, hence, to a lessened absorptive power of the bowels. Without such conditions food has little energy value, and symptoms of undernutrition slowly but surely supervene. I cannot discuss the metabolism of this condition, but I can say that perverted metabolism of all organs is present.

Toxemia of intestinal origin is due to the absorption of abnormal amounts of normal products or to normal absorption of abnormal products. By this I mean that excessive intake of food or deranged intestinal activity will lead, under certain conditions, to absorption of large amounts of the products normally or abnormally present. This excess taxes the liver in its effort to convert the nitrogenous products into urea, in its effort to elaborate the carbohydrates into glycogen, and in its attempt to furnish sufficient bile to permit of the absorption of the fat. Failing in this, the liver must allow the excess to pass from it in the unelaborated state. Such a condition overloads the blood with purin bodies, with amino-acids, with sugar, and with other substances, which exert toxic effects on the system, in case the accessory organs are unable to handle them. I cannot discuss the influence of excess of uric acid or of sugar in the blood beyond the statement that well known conditions arise from such an excess.

It is, however, with the abnormal decomposition products of intestinal activity with which I desire to deal in this discussion. Where can we draw the line between normal and abnormal decomposition in the bowel? That the products formed may exert some toxic action on the system is true, but we must not exaggerate these influences. We are indebted to Bouchard for the doctrine of intestinal auto-intoxication, and, since his publications, a general belief has prevailed that decomposition in the intestines plays a large role in the production of disease and errors of metabolism. The question is very apropos, To what extent and under what conditions may normal products of putrefaction and fermentation cause disease? The number of putrefactive products which occur in the intestine only under pathological conditions, and to which any toxic action can be attributed, is remarkably small. Skatol, indol, etc., may cause headache, neuralgia, neurasthenic symptoms, etc., yet, as Rovighi

has shown, symptoms of poisoning are evident in dogs only when 1 gram per kilo is injected. The production of acetone and diacetic acid in the bowel has been assumed by Peters, Litten, von Jaksch, Lorenz, and others to be a sign of intestinal intoxication leading directly to a state of acidosis, which markedly affects the general metabolism. Keller, Pfaundler, Czerny, and others have made this condition accountable for the cyclic vomiting in children. We now know that, although these acetone bodies are formed to some extent in the bowel, yet they occur as common accompaniments of starvation, especially as regards the carbohydrate foods. Ptomaines, such as putrescin and cadaverin, have been found in the urine and feces by Udransky and Baumann, Stadthagen and Brieger in cases of cystinuria, which were associated with abnormal protein decomposition. It is quite possible, when the true nature of this disorder of metabolism is known, that these substances may be found to be derived from abnormal tissue metabolism and not from that of food products.

The subject of the influence of these decomposition products on general metabolism is still an unknown field. Little is found as to the effects of such substances. While it is true that abnormal decomposition in the intestine is associated with abnormal products, yet none of these products, so far isolated, has been proved sufficiently toxic to account for the general effects of such disturbances. It seems to me that the results observed following intestinal disorders are to be explained by the effect of the products of abnormal decomposition upon the metabolism of other organs rather than by the direct effects of the products themselves. The question of intracellular activity is more fertile, in my opinion, as a field of research than is the constant study of the products of bowel activity. No question can be raised that intestinal toxemia occurs, but its causation is still unsolved. It may be that some product, at present unknown, may be found that is sufficiently toxic to account for the effects, yet the secondary metabolic effects seem to me the more plausible.

Hepatic Toxemia. The liver, owing to its many functions, is one of the most important organs of the body. While its secretory activity is confined to the elaboration of bile, its so-called internal secretory functions are of great influence upon the general metabolism. It is in the narrow space of the liver cell that we find localized the formation of glycogen from sugar, the conversion of the amino-acids and ammonium compounds into urea, the neutralization of extrinsic and intrinsic toxins, the conjugation of aromatic bodies with sulphuric and glycuronic acids, as well as the storing up of fatty acids and soaps. Any disturbance in any of these functions is promptly felt by the system as a whole.

In the discussion of toxemia of hepatic origin I shall not consider the toxic effects due to stagnation of bile. The formation of bile is a

specific vital function of the liver, and it is self-evident that its involvement or abolition, as a result of pathological changes in the organ, cannot continue without severe reactions upon the system in the sense of an auto-intoxication (Weintraud). Such metabolic results of jaundice of short or of long standing are too well known to require elaboration. The bile acids, with their known effect of producing hemolysis and slowing the pulse, will likewise be passed over, as such activity is not due to a direct disturbance of metabolism, but rather to a specific action of these compounds. While it is true that jaundice, acute yellow atrophy, cirrhosis, phosphorus poisoning, etc., have definite influence upon the local and the general metabolism, yet in this discussion I do not have reference to specific disease of the liver, but rather to the toxemia as a result of insufficiency of this organ. It may be said that there are no functional disturbances of the liver cells that are pathognomonic of absolutely definite changes in the hepatic parenchyma. As every disturbance of the activity of the cells influences the proper performance of other functions, a number of phenomena are combined in this symptom-complex of hepatic insufficiency.

One of the most important functions of the liver is its antitoxic power. As Weintraud has well said: "The antitoxic functions of the liver may be, to a great extent, comprehended by recognizing a protective action in each of the numerous metabolic indications by which the functional activity of the normal liver cell manifests itself, and by seeing an intoxication in the disturbance of these functions. At all events, the normal composition of the tissue juices is altered, and they depend upon hepatic integrity for their adequate maintenance. Just as the synthesis of urea from the toxic ammonia permits the harmless urea to be excreted, so the formation of glycogen from the carbohydrates prevents an overloading of the system with glucose. The poisonous products of digestion of protein are converted, during their passage through the liver, into non-toxic compounds, while the free fatty acids and soaps, which arise in intestinal digestion of fats, and which are toxic in large amounts, are retained and stored up in the liver. The formation of bile likewise frees the body from other injurious products of cell activity." Although there may not be enough constancy in the so-called hepatic insufficiency to warrant the assumption of a clinical symptom-complex, yet there are many evidences of this condition, which lead us to believe that a toxemia may arise from such a source. Few of the tests advanced as diagnostic of such a condition have stood the fire of criticism, but the finding of Strauss, that levulosuria follows the ingestion of 100 grams of levulose during fasting, has remained fixed.

While it is difficult to say just how far other organs may be functionally influenced by the toxic action arising from disturbances of the liver, there can be little question that certain toxemic symptoms may be manifested by disorder of any of the hepatic functions.

Although I cannot go into a discussion of the hepatogenous form of diabetes, due to the insufficiency of the liver to handle the sugar brought to it by the portal vein, or of the various disorders related to the so-called uric acid diathesis, yet these should be borne in mind. It is evident that any perversion of the normal functions of the liver will lead to the accumulation of abnormal products. Normally, autolytic processes are going on in the liver cells, which result in the formation of definite products. These are rendered inert by the same liver cells that produce them. In other words, the liver cell is capable of breaking down and resynthesizing its own constituents. These autolytic products are, as Magnus-Levy has shown, of the acid type, and pass into the circulation unmolested, providing the liver is not capable of exerting a sufficient antitoxic effect. Thus arises a condition of acidosis, whose influences are fairly well known. It is not to be understood that the liver, under abnormal conditions, is the only seat of formation of such bodies, but it is one of the most important. Usually the pathological changes associated with such processes are fatty in nature, as evidenced by the fact that in phosphorus poisoning, acute yellow atrophy, and delayed chloroform poisoning, fatty degeneration of the liver is associated with an increased output of amino-acids and acetone bodies.

A second series of changes which give rise to signs of hepatic toxemia are those associated with disturbance in the conversion of amino-acids, etc., into ammonia, and thence into urea. Here we find an ammoniemia along with irregular autolysis, leading to an increased acid formation either of the amino or oxy series. This condition is quite distinct from that discussed above and has a separate function of the liver to deal with. The combination of these two conditions has lead to the assumption by Croftan and others that the liver is more at fault in the causation of uremia than is the kidney. Yet we must remember that were the kidneys not involved uremia would not occur, although symptoms somewhat resembling it may obtain. The general metabolic effect of such a condition is more in the foreground in such cases than is the hepatic or renal disorder, yet the hepatic insufficiency is, in some degree, accountable for the overloading of the system with such products, while the renal insufficiency prevents their excretion.

Another class of hepatic toxemias is found in a low-grade infection of the gall-bladder. I have recently seen, through the courtesy of one of our leading physicians, a patient who had been treated for ten months for dilatation of the heart without the slightest effect. Indeed, the trouble had progressed. On simple drainage of the gall-bladder, although no symptoms pointed to this organ, the cardiac symptoms became better, and within a few days had almost subsided, the heart being reduced to about normal size. This points, it seems to me, to some obscure toxemia, with the gall-bladder as its source. As the bile excretes many of the toxic substances carried to

the liver, it seems rational to suppose that, through some perversion of metabolic activity, such products, possibly of bacterial origin, were either not excreted into the bile, but were passed into the circulation, bringing about a toxemia, or, being excreted, a low grade inflammation of the gall-bladder ensued, which may have induced the condition found. We all know that the myocardium is extremely sensitive to untoward influences, so that the above assumptions do not seem far-fetched.

We must grant, therefore, that many metabolic perversions of the liver may lead to definite toxemia, although this may not always be manifested by a clear etiology. Certain it is that some of these toxemias of hepatic origin are associated with urinary and blood findings, which are not, it is true, pathognomonic, but do point to the probable source of the trouble.

Renal Toxemia. That toxemia of renal origin occurs is unquestioned, but the cause of such a state is unknown. All gradations of such intoxication, from the intense acute uremic state to the slow chronic form, are observed. The theories advanced regarding the causation have for the most part as a basis the idea of overloading of the blood with urinary constituents as a result of an insufficient kidney. Opposed to these theories are those that hold that hydremia, with resulting œdema of the brain, is at the bottom of the symptomatology. These latter ideas are especially advocated by Rees and Traube, but do not seem convincing, inasmuch as certain factors assumed by the advocates are at times missing, and hence cannot be regarded as causative in all cases. We all know that retention of almost every constituent of the urine has, at one time or another, been held to be the etiological factor in uremia. One by one these substances have been abandoned, until now we cannot grant that anyone is specific in the causation of this group of symptoms. From the time that retention of urea was advocated by Wilson until the list had been exhausted by Bouchard in his assumption of organic urotoxins, we have been obliged to change our ideas of the factors responsible for this trouble. Opposed to these views are those of Frerichs, Demjankow, and the closely related one of Treitz, which assumes an ammoniemia as the causative agent. Strauss found that ammonia was increased in the blood, but at the same time nitrogenous bodies, other than albumin and urea, were present, which must play a role in the etiology. He shows that, while the salt content of the serum in uremia does not change, the amount of nitrogenous constituents contained in the hydremic serum, that is, the retention nitrogen, is, as a rule, increased to a great extent. In connection with this work of Strauss one must mention the findings of Gumlich and Richter, that ammonia, alloxur bodies, and extractives were markedly increased in the urine of uremics. As von Noorden states: "A thorough inquiry into the localization of these substances and into their toxic action in cases of renal insufficiency is

much needed. It will also be necessary to ascertain how and to what extent glands, such as the thyroid and suprarenals, react to the intoxication; whether by insufficient or excessive secretion, or by the production or neutralization of the products of metabolism. When we are acquainted with all the factors which probably go to determine the appearance, progress, and prevention of uremia, it will no longer seem strange that it cannot be correctly estimated or adequately explained either by the deficit in the metabolic balance or by quantitative analyses of the blood." It is certain that no definite explanation of this toxemia can be given at present, although many attempts have been made to account for it.

It is well known that complete anuria may obtain and yet no symptoms of toxemia be present. This should prove that it is not alone the retention of waste products that brings about this syndrome, but rather some unknown influence acting upon the general or special metabolic activity. Toxemia of renal origin surely, is a clinical entity, but just what the mechanism of the process is is still unsolved. It may be that the little understood secretion of the kidney may be at fault, but until more is known regarding this speculation is superfluous.

Thyroid Toxemia. The thyroid is of great importance in the general metabolic activity of the system. When this organ is lacking, owing to disease or to removal, a marked lowering of the general energy relations ensues, while in cases in which its function is exaggerated a great increase in the total consumption of energy is noted. There is no organ, with the possible exception of the working muscle, which exerts such an influence on the energy relations as does the thyroid (Magnus-Levy).

The thyroid excretes in its colloid substance an active product, thyreoglobulin, which is combined with the specific iodothyrin. This substance is, no doubt, the one to which a great deal of the influence of the thyroid is due, yet no absolute data bearing on this are at hand. The internal secretion of the gland finds its way through the lymph stream into the blood, whence it passes to the various organs upon which its influence is exerted. It is known that definite signs of toxemia follow both the excessive and the deficient action of this organ. It is necessary only to cite the symptoms in a well marked case of Basedow's disease, such as hyperidrosis, exaggerated reflexes, restlessness, tachycardia, tremor, etc., as well as those of myxœdema or of cachexia strumipriva, to carry my point. Just what are the etiological factors at the bottom of these conditions is unknown, and it seems useless, in the present state of our knowledge, to speculate. Two theories have been advanced to account for the action of this gland, but neither seems convincing. The first, the so-called secretion theory, is that failure of the internal secretion of this gland causes not only quantitative but also qualitative changes in the metabolism, so that poisonous products appear which either do

not obtain normally, or are "disintoxicated" by the thyroid secretion. The second theory, the so-called antitoxic theory, varies from the first in that the antitoxic action takes place in the thyroid itself through the influence of the specific iodothyrin.

This internal secretion of the thyroid is known more by its effects than by its properties after isolation. Even the iodothyrin is not a definite chemical entity, as it has been shown to have varying amounts of iodine. That excessive activity leads to different results from deficient function is evident, yet the variations may be more quantitative than qualitative.

Many other conditions, which may be classed as toxemic, are observed following perverted metabolism of the suprarenal glands, of the hypophysis, of the ovaries, and of other organs. The symptoms of such toxemias are not so well marked, in all cases, that an absolute diagnosis may be established, yet the etiological factor at the bottom may often be discovered by careful consideration of the normal functions of the various organs mentioned. It is true that the function of some of these organs is unknown, and that their internal secretion is even more obscure, yet we may hope that research will unravel these mysteries and throw a definite light on the origin of these obscure toxemias.

Conclusions. Toxemia, aside from that following the acute or chronic bacterial processes, is always of metabolic origin. The toxemias under discussion are more the effects of a general metabolic perversion than of a direct organic disorder. A specific toxemia, in the sense that it is due to a specific substance, is unknown in the class of toxemias discussed.

THE RELAXED KNEE-JOINT.[1]

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During the last few years great advances have been made in the diagnosis of the non-tuberculous chronic joint diseases, and, in consequence thereof, in their treatment. These advances have been made possible by the use of the Röntgen rays, by the laboratory study of diseased joints, as well as by the material obtained by operations. Indeed, these operations themselves have been the source of much enlightenment. We have learned thus to distinguish and to recognize the clinical meaning of the different forms of infectious

[1] Read at a meeting of the Southern Surgical and Gynecological Association, New Orleans, La., December 18, 1907.

arthritis and to separate the hitherto confused forms of chronic atrophic and hypertrophic processes in the joints. The significance and importance of the hypertrophied joint villi have become clear to us, both in their role of secondary factors and as the primary source of joint disturbance. At the same time there still remains a not inconsiderable number of cases that clinically cannot be included in any of these groups; they present no radiographic abnormalities, they are not infectious in their nature, and objectively they fail to give clinical evidence of enlargement of the joint villi. It is to some of these cases that I would for the present ask attention. In my own experience they concern altogether the knee-joint; they have been most often alluded to under the caption of "functional" affections, and they have been described by some excellent authors as joint neuralgias. Some of them, and not an inconsiderable number, are found to be the expression of joint strain and disturbance due to loss of the static equilibrium at the ankle and in the foot, the remoter results of the weak and flat foot. That such knee symptoms, and even organic change of temporary character, may be the clinical manifestations of weak and pronated feet in the complete absence of subjective symptoms attributed to the feet, it has been my privilege to point out in a former paper.[2]

Etiologically considered, the cases with which I am especially concerned appear to divide themselves into two groups, according as they are thought to be the more or less direct result of trauma or not. They are also divisible into two classes according to the nature of the symptoms presented. In the one there is complaint of joint pain, altogether or largely dependent upon the function of the joint; the pain is for the most part referred to the front of the joint, frequently under the patella. Ascending or descending steps is usually described as particularly painful, and after prolonged walking and standing, pain may continue for some time after the joint is at rest. So, too, after unusual use of the joint serous effusion may ensue, to disappear promptly after abstaining from use for a while. In the second group of cases the patients come with a recital of symptoms which are frequently remarkably like those of injury to a meniscus. They are characterized by the occurrence of attacks of very sharp pain, immediately followed by complete loss of strength in the joint, so that the patient often falls; upon moving the joint a few times the pain commonly disappears, but is followed by the development of an effusion into the joint. After a few days of joint soreness and sense of insecurity, the effusion vanishes and an interval of comparatively normal function ensues. Since these attacks usually happen in the absence of the surgeon, and since they are ordinarily of short duration, there is not seldom doubt as to whether actual "locking" of the joint has occurred. In only two instances

[2] Cleveland Journal of Medicine, July, 1901.

have I been able to witness the attack itself, and in both of these I was able to decide that the joint was not locked, but simply held rigid, because of the exceedingly intense pain. For the most part, in my cases, these attacks have not come on during considerable exertion, but rather when the patient was standing, off his guard, and with attention concentrated upon some occupation. In one of my most characteristic cases, that of a young woman, the attack occurred a number of times while dressing the hair.

If, in either of these groups of cases, the joint be examined in the interval between attacks and at a time when effusion is absent, a condition will be found that is so nearly normal that it is likely to be pronounced so unless the examiner has put been on his guard by the history and by his familiarity with its meaning. There is no swelling; tenderness may be entirely lacking or confined to a circumscribed space in the joint line, and thus easily overlooked; the excursions of the joint are normal and painless; and *x*-ray photograms are absolutely negative in showing any abnormal condition. There is none of the grating so characteristic of villous hypertrophy in the most typical of these cases; it is found not infrequently, however, and must then be looked upon as the indication of such enlargement of the villi as a secondary process.

That which is characteristic of the cases under discussion is an atrophy of the quadriceps extensor of the thigh, a shrinkage in volume which is usually to be perceived by the eye if looked for in comparison with the other limb, and certainly to be ascertained in more definite terms by the use of the tape line. In this quadriceps atrophy and the weakened power of extension caused by it, we have then the chief mark of the joint condition from a clinical standpoint; but it is also explanatory of the pathology of the affection and of its etiology. In my cases the difference in circumference of the thigh just above the knee has varied from ½ to 1 inch. In several cases the circumference of the calf was also less than that of the normal side. In the greater number this was, however, not so. It is necessary to be accurate in the method of measurement in order to avoid self deception, particularly so in attempting to estimate the influence of treatment. On account of the conical shape of the thigh, the measurement must be made at precisely the same level on both sides if error is to be avoided. I accomplish this by having the patient stand before me; a carpenters' level being held against both thighs, with the spirit bubble centred, a horizontal mark is made at exactly the same height on both sides, with a skin pencil. The level being put aside, the circumferences are now taken, the tape being each time adjusted to an equal degree of tension. In this manner all practical error may be avoided.

Having recognized the atrophy of the quadriceps as the one external physical sign of this joint affection, it requires only a thought of the physiology of the knee-joint to explain the symptoms. The

quadriceps is normally the "tensor" of the knee-joint capsule. In its atrophied and therefore weakened condition it fulfils its duty in this respect so imperfectly that, instead of being held taut to the normal extent, the capsule remains relaxed during movement, and is thereby subjected to repeated traumatisms by getting squeezed and pinched between the femur and the tibia. It is natural to expect the character of the symptoms to depend upon the degree of relaxation, and therefore upon the extent to which the capsule falls into folds. If, as is likely in the absence of correct diagnosis and proper treatment, this condition exists for a considerable length of time, the repeated traumas followed by inflammatory reactions are likely to produce a chronic state of hyperemia in the joint capsule; this, in turn, causes the enlargement of the fat tabs of the joint, and the so-called villous arthritis, with its characteristic grating, is before us.

Granting that the existence of the quadriceps atrophy is recognized and its role in producing this symptom-complex acknowledged, the question of its cause becomes uppermost. In several of my cases the history of trauma to the joint was evident. In 4 of my cases, however, the patients denied having suffered injury to the joint until I insisted upon the importance of apparently slight trauma. In all of them I was then finally able to determine a traumatic factor: a severe bump against a chair, a bruise, a twist of the knee at playing hand-ball, a fall upon the bent knee. I therefore look upon this atrophy as due to trauma of the joint, or at least in its neighborhood, and I believe, at the same time, that my cases furnish evidence of the reflex nature of this atrophy. This is the more interesting since experiments upon animals have recently caused Bum,[3] Firgan,[4] and others to favor the theory of "inactivity." However, in view of the fact that in several of my cases the limb was used in the ordinary manner without intermission from the time of injury, the conclusion seems permissible that not only must the atrophy have been of reflex origin, but also that trauma of comparatively slight degree is capable of bringing this about. I am strengthened in this belief by cases of very similar kind reported by Paalzow,[5] Caspari,[6] Heidenhain,[7] and Hoffa.[8] I shall abstain from further discussion of the manner in which this reflex atrophy is produced, as being unfortified to a sufficient extent by facts, and therefore of too purely theoretical interest.

In hospital and private practice I have been able to observe 9 patients whose clinical symptoms I have attempted to portray in the foregoing description. I shall omit the narration of the case

[3] Zentralbl. f. Chir., 1905.
[4] Archiv f. Unfallheilk., Band ii, p. 167.
[5] Deut. militärärtstl. Zeitschr., 1899, Heft 4.
[6] Archiv f. Unfallheilk., Band i, p. 219.
[7] Monatsschr. f. Unfallheilk., 1894, Nr. 12.
[8] Therapie der Gegenwart, 1903, 1.

histories, as adding nothing to the value of this report. As the result of this experience, however, I feel justified in advocating the description of the relaxed "knee-joint" as a distinct syndrome, and not simply as a feature or variety of villous arthritis. On the one hand, a number of these cases of relaxed joint fail to present evidence of villous enlargement at any time; on the other hand, villous enlargement is very frequently seen as a manifestation secondary to joint inflammations of various kinds, and even to tuberculous disease.

In view of the fact that muscular atrophy is so frequently the accompaniment of chronic joint disease, but especially since the trauma causing the muscular shrinkage may have done deeper damage to the joint, even to the extent of injuring a meniscus, it may be surmised that accurate diagnosis is frequently far from easy. The hope that the newer method of examination by the *x*-rays after distention with oxygen gas would enable us to determine accurately an injury of the meniscus, has also proved to be vain. Wollenberg[9] has come to this conclusion after exhaustive experiment. In my experience, the most valuable point in distinguishing between the relaxed knee and that with injured meniscus is the fact that in the latter condition the subsidence of joint disturbance between attacks is likely to be incomplete; some swelling of the capsule is likely to remain, and some limitation of motion at the extremes is nearly always present. That these conditions will be found in long-standing cases of relaxed knee as the result of secondary villous hypertrophy is self-evident, but here we have also the physical evidences of villous overgrowth. From the foregoing it must be apparent that occasionally exact diagnosis is a matter of no mean difficulty, and calls for nice judgment. It is preëminently a diagnosis "by exclusion."

Treatment. Having accepted the foregoing explanation of the nature of the joint symptoms under discussion, the therapeutic indications would seem to be clear enough. If the atrophy of the quadriceps and the relaxed condition of the joint capsule are responsible for the symptoms, vigorous measures toward restoring the muscle to its normal strength and volume, toward improving the circulation in the capsule itself, must result in bringing about normal conditions again. Accordingly, we should devote ourselves to an energetic course of treatment by gymnastics: resisted extension of the leg upon the thigh, exercises upon suitable apparatus looking toward the development of the quadriceps in particular, faradic stimulation of the muscle, vibratory or manual massage, alternate hot and cold douches, etc. When by these means we have succeeded in restoring the volume of the muscle to the normal, the symptoms will have disappeared. Usually this will be accomplished in from six to

[9] Zeitschr. f. orthop. Chir., Band xix, p. 253.

ten weeks; having instructed the patient to continue some simple home exercises for a longer period, he may be practically dismissed from treatment. In some cases, however, the recovery is not so simple nor so rapid. Despite our best efforts, the return in strength and volume of the extensor is so slow as greatly to try the patience of the patient and the faith of the surgeon in his diagnosis. This has also been the experience of others. It has furnished ground for the theory that injury of considerable moment has been done to the spinal centres. Caspari is inclined to lay stress upon the effect of concussion, at the time of injury, upon the central nervous system. One of my cases would seem to lend strength to this view, since the patient, who was a locomotive fireman, was injured in a wreck and gave every evidence of having sustained damage by great violence. Two of my patients were pronounced neurasthenics before the injury, which might thus have acted upon a nervous system which was more than commonly susceptible. These 3 patients were the ones in whom the recovery was more than ordinarily slow, requiring in one case a period of six months. However, in all of my cases complete and lasting recovery ensued by persistent use of the methods above mentioned, aided in some by measures looking toward improvement of the general health. The rather common practice of ordering elastic bandages and knee-caps for these cases is to be deprecated; it can only serve to delay the disappearance of the muscular atrophy.

In summarizing, it seems fair to say:

1. Many cases of so-called "functional" knee symptoms are due to reflex atrophy of the quadriceps extensor muscle following injury.
2. The term "relaxed knee-joint" should be reserved for such cases.
3. The injury may be so slight that its etiological relation may be overlooked.
4. The atrophy following in many cases cannot be explained by the theory of "inactivity."
5. In the cases under discussion, the cure will be brought about by the restoration to normal volume and strength of the quadriceps extensor muscle.
6. In some cases the recovery is so protracted as to warrant belief in material damage to the central nervous system.
7. While in such cases our endeavors are necessarily limited to treatment at the periphery, ultimate recovery may be expected to follow persevering and well directed effort.

PRIMARY COLLOID CARCINOMA OF THE VERMIFORM APPENDIX.[1]

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The specimen presented was obtained August 15, 1907, at an autopsy on a subject dead of acute intestinal obstruction. The cause of obstruction was determined only at the autopsy, and had no bearing on the condition found in the appendix.

The patient was an old woman, aged seventy-five years, who up to the time of the acute symptoms had been going about in apparently good health. There was no family history of tuberculosis or cancer. Thirty-five years previously she had had a severe attack of "inflammation of the bowels," evidently an acute appendicitis, as was shown at the autopsy. Two years ago she had an intrascapular fracture of the right femur, but had made a good recovery. During the past three months she had lost considerable weight—she thought about fifteen or twenty pounds—but had not felt any ill effects, nor had any cause been found for this disturbance in nutrition. There had been some constipation, but not sufficient to attract serious attention, and no blood or other unusual features had been noticed in the stools.

The acute illness in itself was of considerable interest. Briefly, there had been an acute attack of abdominal pain, with vomiting, followed by symptoms of partial intestinal obstruction for five days, with but little constitutional disturbance. No cause of obstruction was found on physical examination, and conditions did not justify an exploratory laparotomy. On the sixth day obstruction became complete, and the constitutional condition was extremely bad from that time until death, on the ninth day of illness.

At autopsy the obstruction was found to be due to a Richter's hernia of the small bowel into the right femoral ring (Fig. 1). The portion of bowel involved was only a short distance above the ileocecal valve. The peritoneum generally was free from adhesions.

The appendix was found lying deeply and bound down to the posterior wall of the abdomen by dense adhesions. Its direction was inward and backward along the brim of the pelvis. It was about two and a half inches in length; the distal portion had undergone a symmetrical overgrowth to the diameter of half an inch. Only about half an inch of the proximal end remained free from overgrowth (Fig. 2). The appendix was white in color, with numerous small vessels showing prominently on the surface. On palpation, it was quite hard. On section, the growth was white and dense in the outer part; the central portion contained a white col-

[1] Read at a meeting of the Montreal Medico-Chirurgical Society, October 4, 1907.

loidal material. The cecum and other portions of the gastro-intestinal tract showed no sign of overgrowth. A single gland at

FIG. 1.—Richter's hernia of the small intestine into the right femoral ring.

FIG. 2.—Carcinoma of the vermiform appendix.

the angle of the cecum and ileum was enlarged to the size of a cherry and hard; no other mesenteric glands were enlarged, and there was no metastasis in the liver, spleen, or kidneys.

Sections of the appendix showed marked irregular overgrowth of the epithelium invading all the deeper tissues. The masses of new-growth in most places had undergone a complete colloidal degeneration, but in some parts typical glandular carcinoma formation was seen, the glandular epithelium being greatly proliferated and invading the tissues below the basement membrane. Other portions showed masses of irregular epithelial cells, with the colloidal changes not so extreme. Sections of the mesenteric gland showed the glandular tissue replaced by irregular masses of epithelial cells, for the most part showing extreme colloidal degeneration.

The specimen is of interest chiefly as a pathological rarity. In 1900 A. O. J. Kelly[2] collected 20 cases, and in 1905 was able to increase the number to 40.[3] Elting[4] collected 43 cases, but admits only 23 as undoubted instances of the condition. In 1906 Rolleston and Jones[5] published a very valuable study of 42 cases of undoubted primary malignant disease of the appendix, of which 37 cases were examples of different types of carcinoma. Many of the cases were only discovered in the routine examination of appendices removed at operation.

THE MANAGEMENT OF LABOR IN MINOR DEGREES OF PELVIC CONTRACTION, WITH SPECIAL REFERENCE TO THE RELATIVE INDICATIONS FOR ABDOMINAL CESAREAN SECTION.[1]

A TABULATED REPORT OF EIGHTEEN CESAREAN SECTIONS.

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For a long time the maternal mortality of Cesarean section was so high that the operation was considered one of last resort. The death rate ran from 50 to 60 per cent., and Budin made the statement that not a single successful operation was performed in Paris from 1787 to 1876. Harris published statistics of the result in this country which discouraged anyone from undertaking the operation, and reported 11 operations in New York, with 10 deaths. The improved technique inaugurated by Sanger twenty-five years ago,

[2] Proc. Path. Soc., Philadelphia, 1900, p. 109.

[3] Treatise on Appendicitis, by John B. Deaver, chapter on Pathology, third edition, 1905, p. 143.

[4] Annals of Surgery, April, 1903, p. 549.

[5] Amer. Jour. Med. Sci., 1906, cxxxi, 951.

[1] Read at a meeting of the Southern Surgical and Gynecological Association, New Orleans, December 17, 18, 19, 1907.

however, placed the operation on a different footing. Under the new conditions, that have since obtained, the borderline between absolute and relative indications has been changed and increased about 2 cm. In 1901 Williams,[2] of Baltimore, advocated that the absolute indications be changed from 5 to 7 cm. in the justominor pelvis, and from 5.5 to 7.5 cm. in the simple flat pelvis. This proposition has been endorsed by Webster, Jewett, and Edgar. Dorland and Hirst make it 6.5 cm.; Peterson, 6.2 cm. Edgar makes a distinction between the presence of a living and a dead infant, the absolute indications being 7.6 cm. and 6.3 cm., respectively. The relative indications run from these minimal diameters up to 8.5 cm. in the simple flat, and 9 cm. in the justominor pelvis. Above these measurements it is generally conceded that a living infant can be extracted through the natural passages.

All operators recognize the importance of early surgical interference before the woman has gone through the exhaustion of prolonged labor pains, and particularly before employing forceps and manipulations that may produce infection.

Reynolds,[3] of Boston, in a valuable paper, has classified Cesarean sections as primary, secondary, and late. The primary include cases operated upon just in advance of the time of expected labor; the secondary, those performed after a few hours of labor; and the late, those performed after labor has been allowed to go on for some time, and when it has been clearly demonstrated that the natural forces cannot overcome the obstruction at the pelvic inlet. He reported 289 operations during the last ten years by twenty different operators. The mortality in the first class was 1 death in 82 cases (1.2 per cent.); in the second, 158 cases, with 6 deaths (4 per cent.); and in the third, 49 cases, with 6 deaths (12 per cent.). The death rate was clearly proportionate to the duration of labor before operation.

Some obstetricians object to elective Cesarean section because they fear that defective drainage through the undilated cervix will give rise to infection. On that account they prefer to let the first stage progress far enough to open the cervical canal. All agree, however, on one point, and that is, not to let the labor progress until the woman is exhausted or infected. A high mortality and discredit to the operation are the result of its performance under opposite conditions.

To see the cases early, to recognize the possible necessity for Cesarean section, and to conduct the labor accordingly are the great needs of modern obstetric surgery. A large proportion of obstetric work falls into the hands of the general practitioner, and it behooves him to rise to the occasion and to recognize early the cases of disproportion between the infant's head and the maternal pelvis. Too

[2] Trans. Amer. Gynecological Society. [3] Ibid., 1907.

often he fails to do this until the situation is forced upon him by a long and exhaustive second stage, or, still worse, after the injudicious and fruitless use of forceps. The life of the infant is then seriously jeopardized, and the time for a successful Cesarean section is passed. The general practitioner is now more familiar with the symptoms of ectopic pregnancy, and his prompt diagnosis saves many lives; he should be equally wide awake to recognize pelvic deformity. First, he should be taught the frequency of the existence of pelvic deformity, and the importance of pelvimetry; and second, he should make it a rule of practice to examine all pregnant women by palpation and pelvimetry in the last month of pregnancy.

It is the common belief that pelvic deformity is of infrequent occurrence. This is because the condition is overlooked. It is like the doctor who says he has been practising obstetrics twenty years and never saw a lacerated perineum. He has never looked for it.

Edgar says pelvic contraction is often found in women who frequent dispensaries and hospitals. It is true that it is more commonly found in this class, but the complication is not rare in the higher social scale. Modern social life tends to degeneration of the child-bearing functions. Dysmenorrhœa, sterility, undeveloped generative organs, mammary glands, and pelves are the evidences of ill equipment. The generative organs are the last to develop in the growing girl, and, unfortunately, the period of maturity coincides with the period of greatest nervous and physical strain. At this critical time the allurements of society entice the young girl prematurely within its toils. Williams estimates that every fourteenth white, and every sixth colored woman in Baltimore has a contracted pelvis. By far the most common types of deformity are the generally contracted and the simple flat pelvis. The relative frequency of these two types depends largely upon the class of women among whom one works.

Jewett says the simple flat pelvis is a common variety in Europe, but rare in America. Grandin and Jarman, on the other hand, state that the flattened pelvis is a type frequently found, while the justominor is of infrequent occurrence. My own observations, made in Washington, agree with those of Williams, Edgar, and Hirst, that the justominor is the prevailing type of deformity. Williams found it in one-third of all the contracted pelves occurring in the white, and in two-thirds of those in the black women. Hirst says the justominor pelvis is certainly as common in Philadelphia as the simple flat pelvis; and if one judges from hospital patients, among whom there is a large proportion of shop and factory girls, this variety of contracted pelvis would be regarded as the commonest. Dorland entertains the same views. Obstetricians living in the Southern States of this country, where there is a large negro population, find the generally contracted pelvis largely in preponderance.

Investigation by Dr. Edgar Snowden of the records of the Colum-

bia Hospital gives the following results in 532 cases (white 131, colored 401):

	(Approximately) Per cent.
White, all the external pelvic diameters normal	53
Colored, all the external pelvic diameters normal	45
White, all the external pelvic diameters above normal	3
Colored, all the external pelvic diameters above normal	..
White, all the external pelvic diameters diminished	25
Colored, all the external pelvic diameters diminished	49
White, simple flat pelvis	20
Colored, simple flat pelvis	5

According to these figures the measurements indicating the simple flat type of pelvis occurred in 20 per cent. of the white, and only 5 per cent. in the colored women, while those pointing to the existence of a generally contracted pelvis occurred nearly twice as often in the colored women, being 48 per cent. and 25 per cent., respectively. It is not claimed that all of these women had simple flat and justo-minor pelves. The external conjugate measured less than 20 cm. in all; in some it was as low as 15 cm., and the other external diameters were correspondingly reduced. Owing to the varying thickness of the sacrum, the length of the external conjugate is not a reliable index of the length of the internal. A few centimeters more or less may not indicate anything. It is usually stated that when the external conjugate measures between 19 and 18 cm., the true conjugate will be shortened in 50 per cent. of the cases, and when below 17 cm. it is nearly always indicative of pelvic contraction. This is not true, especially if applied to the negro woman, in whom a normal diagonal conjugate is frequently found under these circumstances. It is a matter of common observation that an external conjugate of 19, 18, 17, or 16 cm. is found, and yet many of the women are delivered after a natural labor. One of two conditions exists: (1) The external conjugate is diminished, but the internal is normal. This is due to thinness of the sacrum, and is found in women who possess small structural development of the skeleton. (2) There is some diminution of the obstetric conjugate or of all the internal pelvic diameters, but nature takes care of these women by giving a small baby to pass through a small pelvis. The product of conception is small and the pelvis is small because of non-development of infant and mother. The relation between the diminished weight of the infant and the degree of shortening of the external conjugate diameter of the mother's pelvis is shown by the accompanying chart and is based upon the averages of 272 observations.

On the other hand, it is claimed that contraction of the internal conjugate is rarely found to exist when the external measures 20 cm. or more. In Case 18 of the series of Cesarean sections reported in this paper the external conjugate measured 20.5 cm. The other external diameters were also normal or above, and yet the woman

had a contracted pelvis, with a true conjugate of 9 cm. ($3\frac{3}{5}$ inches). Another patient recently came under my observation with an external conjugate of 20 cm., and the woman had a true conjugate of only 7.5 cm. (3 inches). The interspinous was 25, and intercrestal 28 cm. The only external measurements to excite suspicion were the right and left obliques, which were 2 to 3 cm. short. At her first labor I effected delivery by symphysiotomy. One year later she entered the hospital at the seventh month of pregnancy in premature labor. The waters had escaped and the legs of the infant were in the vagina. Although a small premature infant, it was delivered dead by traction, aided by strong suprapubic pressure.

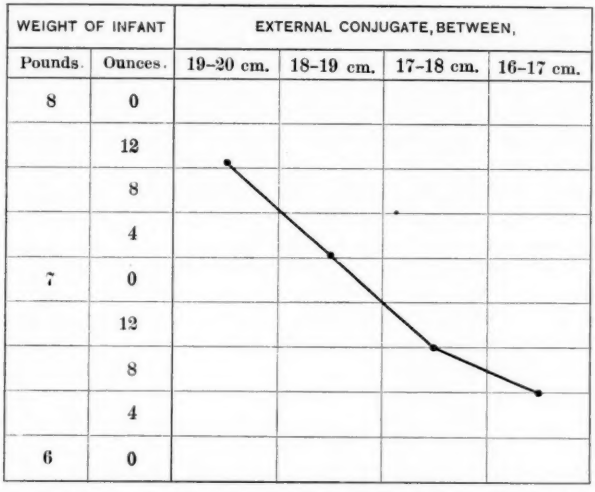

Chart illustrating the relation between the weight of the infant and the shortening of the external conjugate diameter of the maternal pelvis.

The importance of measuring the external oblique is not generally recognized. At the San Francisco Maternity the classification of pelves is based upon the length of these external diameters and the true conjugate. Another case illustrating the importance of the length of the external obliques was examined within the past few days. The woman had been delivered by difficult high forceps extraction twice, with both babies large and dead. She was five months pregnant with her third gestation when I examined her with her physician, Dr. D'Arcy Magee. All of the diameters were normal (including the diagonal conjugate) except the external obliques. The right was 20 cm., and left 19 cm. The internal obliques were clearly diminished by the encroachment of the iliac planes within the pelvic space. Between the spines, 24.5 cm.; between the crests,

25 cm.; between the tuber ischii, 11 cm.; external conjugate, 20 cm. This patient will be put on Prochownick's diet after the sixth month of gestation, and will be delivered by the induction of premature labor, or by Cesarean section at term early in April, 1908.

Pelvimetry should be performed at the eighth month of pregnancy in all primiparæ, and in those multiparæ who have passed through difficult labors. If neglected until the advent of labor, it should be done then in all cases when the head is high, and especially before any attempts are made to deliver by forceps. Shortening or disproportion of any of the pelvic diameters should always excite suspicion. One can clearly understand the importance of the practice of pelvimetry by all practitioners who undertake obstetric work. Unnecessary complications make it unpopular. Some of these are the useless refinements of the measurements, including small fractions of a centimeter or inch, and the many varieties of pelvimeters which claim to possess particular advantages for accurately measuring the diameters of the maternal pelvis and the fœtal head.

In minor degrees of pelvic contraction the length of the pelvic diameters alone is not all important; the size of the infant's head alone is not all important; it is the relative disproportion between the head and the pelvis. Can this head mold and pass through this pelvis? is the question to decide. The answer must be sought by the result of palpation. Palpation requires no complicated instruments, and a little practice enables one to obtain valuable information. By it the obstetrician can ascertian the size of the uterine tumor, the relative proportion of the contents—infant and amniotic fluid, and consequently can form a fairly accurate opinion of the size of the infant—whether small, of average size, or large. The position of the infant is made out, and, if it is a head presentation, whether or not the head is engaged within the inlet. If not engaged, can it be made to do so by pressure in the line of the axis of the superior strait? In a primipara the head should be always engaged, under normal conditions, and descended within the pelvic cavity after the eighth month of gestation; in a multipara, if disengaged and movable above the brim, it ought to engage by suprapelvic pressure, with or without anesthesia.

In minor degrees of pelvic contraction, discovered in the thirty-second week of pregnancy, modern obstetric practice points out three lines of treatment: (1) The induction of premature labor; (2) elective Cesarean section; and (3) delay until labor has demonstrated the resources of nature; then (*a*) spontaneous delivery; (*b*) version; (*c*) axis-traction forceps; (*d*) Cesarean section; (*e*) symphysiotomy or pubiotomy; or (*f*) craniotomy.

1. The Induction of Premature Labor. We must recognize that there is a slight increase of danger to the mother, and a very material risk to the infant, by this method. The earlier the interference is required the greater the risk to the infant; therefore, the

inducing of premature labor is not justified before the completion of the thirty-sixth week of pregnancy, unless the mother has previously given birth to very big babies. Beginning at the thirty-second week, the case should be tested weekly to see that the head can be pressed down into the inlet. If it can be carried on in this way to the thirty-sixth or thirty-seventh week, labor may be induced. If engagement cannot be made successfully before that time, it is not, as a rule, a proper case for the induction of premature labor. If the disproportion be decided, it is a case for elective Cesarean section; if not decided, it may go to full term, and after labor pains have been in progress for several hours it may still be a proper case for section, unless there is good assurance of a successful delivery through the natural passages.

Whether labor has been induced or is spontaneous, the case should be conducted along such lines that the patient will be in a favorable condition for Cesarean section, should it prove advisable. Few examinations should be made, and these with the most rigid aseptic precautions.

In case molding and engagement have occurred, and the conditions give promise of a successful forceps delivery, the woman should be placed in the Walcher position and the instruments employed. If failure results, and the efforts at artificial delivery have not been protracted, the course of action must be guided by the condition of the infant. If its life has been seriously jeopardized, or if destroyed, craniotomy is indicated. If the heart-sounds of the infant be good, and there is hope of saving it, symphysiotomy or pubiotomy is called for.

2. Elective Cesarean Section. When the disproportion between the diameters of the fœtal head and the mother's pelvis is decided, and the head cannot be forced into the inlet by pressure under chloroform, the chance of a successful delivery by the natural passages is so small that Cesarean section should be performed at a period shortly anticipating full term. The best results of the operation are obtained in these cases. If the os be patulous, no trouble will be met with from deficient drainage; if not, it may be dilated from above downward and a gauze drain inserted. Others might prefer, under the latter circumstances, to wait long enough for labor pains to effect some dilatation. My first Cesarean section was performed in 1890.[4] On the fifth day the temperature rose to 101.5°, and the lochia had a bad odor. The cervix was small and the os closed. The canal was dilated with steel instruments, the uterine cavity explored and washed out with a 2 per cent. solution of carbolic acid. The immediate effect of the manipulation was to increase the temperature to 104°; it fell to 99.8° that evening, and then remained normal.

[4] Trans. Amer. Gynecological Society, 1890.

3. Delay until Labor Has Demonstrated the Resources of Nature. This course should be pursued when the disproportion is not great and there is good ground to hope for delivery by the natural passages.

(*a*) In the most favorable cases spontaneous delivery will take place. In minor degrees of pelvic contraction it has occurred in two-thirds of the cases. Molding, engagement, and descent of the head, with good labor pains, hold out promise of success.

(*b*) and (*c*) If failure results, version and axis-traction are held in reserve. Interference by either of these methods should not be attempted unless there is every reason to expect a successful issue. Failure jeopardizes the chances of a subsequent abdominal section.

In deciding between version and high forceps, the choice should be guided by the experience of the individual operator—some preferring one, and some the other. Version is contraindicated in the justominor pelvis, as a rule. Some obstetricians perform version if the head be movable above the inlet, and the high forceps operation if engaged. Personally, I believe it is obsolete practice to perform version or the high forceps operation in any case when a test of labor pains fails to engage the head and the head cannot be forced through the brim of the pelvis with the patient under chloroform. This statement will be challenged by some obstetricians whose opinions are colored by the teachings of the Dublin and Edinburgh schools.

Wright, of Toronto, gives this advice in his text-book of *Obstetrics:* "If, at the end of one hour (of labor) the head shows no tendency to engage the brim, turn and treat as an ordinary pelvic presentation." Again, in minor degrees of contraction of the conjugate (4 to 3½ inches—10 to 8 cm.), "perform version as soon as possible, and treat as an ordinary breach case; or allow the head to mold through the brim, and let nature complete the delivery; or allow the head to mold two or three hours, and then use forceps."

The work of Milne Murray has advanced the claims of high forceps, and he is reported as having successfully delivered infants by this means, with the woman in the Walcher position, through a conjugate of 3¼ to 3½ inches (8 or 8.75 cm.).

Lapthorn Smith, of Montreal, says: "I am strongly in favor of high forceps rather than turning in minor degrees of pelvic contraction. I have delivered a living child with high forceps when labor had been going on furiously for twenty-four hours without the head having engaged at the superior strait."

Others are not enthusiastic supporters of either axis-traction or version in minor degrees of contraction.

Reuben Peterson[5] says: "I do not favor high forceps as a treatment of minor degrees of pelvic contraction. I think it is one of the

[5] Personal communication.

most dangerous operations for both mother and child that we have in obstetrics. Versions are a little better, but not much."

Joseph B. De Lee[6] says: "Regarding high forceps and version in contracted pelvis, I am using both less and less, as they are very serious operations for mother, and also for babe. I avoid them by inducing labor, and by Cesarean section."

E. G. Grandin[7] says: "Version would be my choice with head not engaged, cervix dilated or dilatable, membranes unruptured or just ruptured. High forceps, head not engaged, I never counsel."

E. Gustave Zinke:[8] "If, in a given case, I cannot deliver the patient with any degree of assurance of safety with the high forceps application or version, I prefer to do a Cesarean section."

Franklin S. Newell:[9] "Personally I prefer the abdominal route in all cases in a condition to go through the operation, where there is any reasonable doubt about the ability to abstract a living child through the pelvis, for I believe in proper hands the prognosis of Cesarean section, in proper cases at least, is no worse than that of version or high forceps. . . . The question of choice of operation between high forceps and version always appears to me in this way: that if a high forceps is attempted carefully, and fails, version can be subsequently performed; whereas, if version is performed as the primary operation, and fails, we have no operation left except a destructive one, for we have sacrificed the chances of the baby. So that personally I prefer a high forceps, or at least an attempted high forceps, in all cases of head presentation in which I have decided to deliver *per vias naturales*, rather than to perform a primary version. I recognize that it is a matter of personal equation, and I consider version a somewhat more dangerous, but also more efficient, operation than high forceps. I strongly believe, however, that we should extend our indications for Cesarean section to include the majority of cases in which high forceps or version may be rendered necessary by pelvic contractions."

Guided by these expressions of opinion, and by my own experience, I believe that in cases of labor in minor degrees of pelvic contraction one should "delay until labor has demonstrated the resources of nature," and then act as follows: After from two to six hours of labor, according to the severity of the pains, if the head has not engaged, perform Cesarean section, and not forceps or version. If the head has engaged, attempt a careful application of the axis traction with the woman in the Walcher position, and if the result does not give some assurance of success, perform Cesarean sec-

[6] Personal communication.

[7] Personal communication. In 1890 Grandin published a paper in the Transactions of the American Gynecological Society, expressing advanced views advocating Cesarean section, which practically cover the ground taken in this paper.

[8] Personal communication.

[9] Personal communication.

tion. I believe version and axis-traction, with the head disengaged, are contraindicated by modern obstetric practice.

(*d*) The indications for delivery by Cesarean section should cover cases of minor degrees of pelvic contraction when a few hours of labor pains demonstrate the inability of Nature to mold and engage the head. This indication should be extended to embrace those borderline cases in which the true conjugate is even as much or more than 8.5 cm. for the justominor, and 9 cm. for the simple contracted pelvis. Inability to force the head through the inlet under chloroform should be recognized as a justification for the operation, regardless of the degree of contraction.

Case XVIII of the series reported herewith illustrates this position. The woman entered the Columbian Hospital in the beginning of her fourth labor. The first labor was terminated successfully with a difficult high forceps operation. The infant was not as large as the subsequent ones, and survived with bad head injuries. The second and third labors were terminated in the same way, and both infants were delivered dead. The external pelvic measurements were unusually good: Interspinous, 25.0 cm.; intercrestal, 28.0 cm.; external conjugate, 20.5 cm.; and diagnonal conjugate, 10.5 cm. The woman had a simple contracted pelvis, with an estimated true conjugate of 9 cm. ($3\frac{3}{5}$ in.). Under chloroform, the head could not be made to pass the inlet. She was delivered by section and left the hospital in good condition at the end of three weeks. Her infant weighed $9\frac{3}{4}$ pounds and was vigorous and did well. At the woman's request to be made sterile her tubes were cut and the ends turned in between the folds of the broad ligaments.

High forceps extraction would have sacrificed the infant's life and been as dangerous to the mother as the section. Labor might have been terminated by version with little risk to the mother, but much danger to the infant—a biparietal diameter of 9.75 cm., with a well ossified head, would have had to pass through a conjugate diameter of 9 cm. Symphysiotomy or pubiotomy would most likely have saved both mother and infant, but the tedious convalescence was a deterrent. Also, delivery by any of those methods—forceps, version, symphysiotomy, or pubiotomy—would have left the woman exposed to the risk of subsequent pregnancies and labors. Therefore, in this case, or any similar case, when the head remains above the brim after several hours of labor pains, and when it cannot be made to engage by strong suprapubic pressure under chloroform, modern obstetric surgery points to the advantage of Cesarean section.

Cases XIV, XV, XVI, and XVII were justominor pelves, and labor had continued from twelve to thirty hours without engagement of the head. Three were primiparæ, and Case XVI had previously given birth to a dead infant. A brief report of these cases is as follows:

CASE XIV.—B. J., colored, aged seventeen years, occupation laundress, single, was admitted to Columbian Hospital May 23, 1907. Pelvic measurements gave a justominor pelvis with a true conjugate of 8.5 cm. ($3\frac{2}{5}$ in.). True labor pains began 8 A.M., May 24, and at 7.30 P.M. became quite strong. Examination under chloroform, head not engaged. Cervix dilated manually. At 11.30 membranes ruptured artificially; head tightly wedged in the brim. Forceps tried unsuccessfully. Cesarean section at 1.30 A.M., May 25. Baby delivered in three minutes; time of operation, thirty-two minutes. Patient developed considerable fever, which, on the fifth day reaching 104°, and dropped to normal on the ninth day. She sat up on the nineteenth day and went home on the twenty-fourth day. Mother and baby did well. Weight of baby at birth, $8\frac{3}{4}$ pounds.

CASE XV.—D. T., colored, aged twenty-six years, housewife; admitted to hospital May 27, 1907, at 5.25 A.M., having been in labor for fourteen hours; pains very strong. Justominor pelvis; true conjugate, 7 cm. ($2\frac{4}{5}$ in.). The patient had been examined by a midwife four times without regard to asepsis, and lard was used as a lubricant for the fingers. Cesarean section performed at 1.30 P.M. Time of operation, thirty-three minutes. Highest temperature, 101.5°, on the second day; reached normal on the sixth day. Abdominal distention relieved by stomach tube. Discharged June 27, in good condition. Baby weighed 7 pounds 6 ounces; not strong at time of leaving hospital.

CASE XVI.—K. L., colored, aged twenty years, married, housewife, was admitted April 18, with tertiary syphilis, condylomas on the right side of the vulva. Symptoms cleared up in two weeks by specific treatment. Justominor pelvis; true conjugate 9 cm. ($3\frac{3}{5}$ in.). Labor began 2 A.M., May 27, 1907. After twelve hours of labor the head had not engaged, and could not be forced into the pelvis by pressure under chloroform. Cesarean section performed at 3 P.M. Baby delivered in $2\frac{1}{2}$ minutes; time of operation, 37 minutes. Recovered without complication; baby alive and weighed 5 pounds 14 ounces.

CASE XVII.—M. T., colored, aged thirteen years, single, admitted in labor June 13, 1907, at 12.30 A.M. Justominor pelvis; true conjugate 6.5 cm. ($2\frac{3}{5}$ in.). Twelve hours' labor; Cesarean section. Baby delivered in $3\frac{1}{2}$ minutes; time of operation, 37 minutes. Weight of baby, $7\frac{1}{4}$ pounds. Mother and infant left the hospital in good condition on the twenty-sixth day.

These four sections were performed within three weeks, and two of them on the same day.

(*e*) *The Indications for Symphysiotomy and Pubiotomy.* The objections to these methods of delivery are the tedious and painful after-treatment and retarded convalescence. A retention catheter will obviate the difficulty and pain of catheterization. The neces-

sity of keeping the bones in apposition, the maintenance of the back position for two or three weeks, the difficulty of keeping the parts clean, of giving vaginal douches and proper attention to the evacuation of the bowels, are some of the serious drawbacks to either operation. The employment of a bedpan or douche pan is so painful that, for the first week, it renders life almost unbearable. Unless one is provided with a special bed, it is well to use a cot having a canvas cover, with a hole cut out beneath the buttocks, to permit these attentions without moving the patient.

Complications met with afterward are: tearing of the anterior vaginal wall, œdema or hematoma of the vulva, foul-smelling lochial discharge, fever, and septic phlebetis. The maternal mortality after symphysiotomy and pubiotomy is practically *nil* in the primary operations. Deaths occurring after the secondary operations are due to infection and complications resulting from ineffectual efforts at delivery by forceps before resorting to these operations. Pubiotomy seems to offer little, if any, advantages over symphysiotomy. In a study of this operation in America, I was able to collect 20 cases—12 primary, with no maternal death, and 8 secondary, with 4 deaths. On account of the serious objections stated, I believe it will seldom be performed as a primary operation. Symphysiotomy and pubiotomy will, however, remain useful expedients when one is forced to resort to one or the other in preference to craniotomy upon a living child. When the woman has been exhausted by prolonged labor, by manipulations, by the use of forceps, and when the parts are contused and lacerated, and she is probably infected, nothing else remains to be done.

The following case came under my care recently:

On returning to Washington, October 1, 1907, from a vacation, my attention was called by my associate, Dr. Edgar Snowden, to Mrs. B., a primipara, seven and a half months pregnant. Her husband was in the navy, and she had come from his station in Samoa to be confined. She had a justominor pelvis, and my investigation confirmed his measurements. They were as follows: Interspinous, 23 cm.; intercrestal, 24 cm.; external conjugate, 18 cm.; external obliques, right, 23 cm.; left, 22 cm.; diagonal conjugate, 11 cm.; estimated true conjugate, 9 cm. ($3\frac{3}{5}$ inches). Palpation: Large uterine tumor; normal quantity of amniotic fluid; large infant.

At the time of my examination she had reached the thirty-second week of gestation. The head could be made to engage within the brim at weekly examinations, made to the thirty-seventh week. Cesarean section was considered, but the case gave promise of successful delivery by induced labor. She entered my private hospital, and premature labor was induced after some delay. A bougie was inserted, removed, and replaced the following day. No pains having been excited, the lower segment was packed with gauze. Labor began November 4, 1907. The membranes ruptured spontane-

ously at 8 A.M.; os dilated at 2 P.M., head partially engaged with occiput posteriorly. At 4.30 forceps were employed without success. Patient was taken to the operating room and axis-traction employed with the patient in the Walcher position. The head was brought down into the cavity with a persistent occipitoposterior position. The head was large and well ossified. Effort at manual rectification failed, on account of the small pelvic space. The infant's heart-sounds were strong, and craniotomy was, therefore, considered to be contraindicated. The promising time for Cesarean section had passed, because of the eight hours of hard labor, the manipulations with bougies and gauze packing, the insertion of the hand in the effort to rotate the head, and finally the attempts to deliver by forceps. Symphysiotomy was then performed. The joint separated only 1 cm., which increased to 3 cm. during forceps extraction. The head was delivered with the occiput posterior. The perineum was lacerated in the second degree, and the anterior vaginal wall was torn from its pubic attachment. There was no hemorrhage. Lacerations were sewed up and the patient bandaged and put to bed. The highest temperature was reached on the third day—100.4°. There was marked œdema of the left labium major from the sixth to the tenth day. The perineal stitches of silkworm gut were removed on the thirteenth day, and perfect union resulted. The laceration of the anterior vaginal attachment healed satisfactorily. There was some odor to the lochia for eight days. Examination on the seventeenth day showed good union of the symphysis, except a V-shaped indentation at the lower border. The patient turned on her side, and no movement was felt at the joint. Slight motion was possible at the symphysis by grasping the iliac crests and rocking the pelvis. The infant weighed $9\frac{3}{4}$ pounds and was none the worse for the delivery, except an abrasion on the neck behind the right ear.

The large size of the infant and the persistent occipito-posterior position prevented a successful delivery with the forceps. In the event of a subsequent pregnancy, I should perform an elective Cesarean section and sterilize the patient. She left the hospital at the end of the fifth week, herself and baby in good condition. The joint union was firm and she walked well.

Another indication for selecting symphysiotomy or pubiotomy may also be recognized when facilities are not at hand for performing Cesarean section.

(*f*) *Craniotomy.* The indications recognized for performing craniotomy are after prolonged labor, or failure of version or forceps, and the infant is dead or dying. The diminution of the true conjugate must not be below the limits of an absolute indication for Cesarean section. If craniotomy be rejected on account of the chances of saving the child, symphysiotomy or pubiotomy must be performed if the woman is not in a condition for Cesarean section.

Tabular Report of Eighteen Cesarean Sections.

Case.	Date.	Color.	Diameters in centimeters.							Hours labor.	Previous labors.	Indication for operation.	Result to mother.	Result to infant.	Weight of infant.	Remarks.
			Inter-spinous.	Inter-cristal.	Right oblique.	Left oblique.	Conjugate externa.	Conjugate diagonal.	Conjugate vera.							
1	Feb. 9, 1890.	W	19.0	14.0			14.0		4.0	39	0	Absolute; dwarf; flat; generally contracted.	Recovered.	Lived.		Reported in Transactions of American Gynecological Society, 1890.
2	Aug. 1894.	W								0	0	Rachitic; flat; absolute.	Recovered.	Lived.		Elective operation; patient of Dr. W. S. Bowen. Operation at Garfield Hospital; records lost.
3	Mar. 13, 1903.	C	23.5	25.0			19.5			48	2 normal.	Normal pelvis; ventrofixation.	Recovered.	Lived.	6 lbs. 12 oz.	Dystocia due to ventrofixation.
4	Apr. 14, 1903.	C	23.0	23.0	19.0	18.0	16.0	9.0	7.0	20	0	Flat; generally contracted.	Recovered.	Died.	5 lbs. 13 oz.	Absolute indication; infant stillborn.
5	Oct. 13, 1903.	C								0	0	Elective; hip-joint disease; obliquely contracted pelvis.	Recovered.	Lived.	8 lbs.	Scoliosis; rachitic, flat pelvis; absolute indication; operation at Garfield Hospital; records lost.
6	Nov. 17, 1903.	C	24.0	28.0	22.0	22.0	17.0	8.0	6.5	12	0	Flat, rachitic pelvis; absolute.	Recovered.	Lived.	7 lbs. 4 oz.	Head not engaged; absolute indication.
7	Feb. 22, 1904.	W	23.5	26.5	19.5					0	2 normal.	Fibroid in pelvis.	Recovered.	Died.	3 lbs.	Normal pelvis; operation at seventh month of pregnancy; Porro.
8	June 2. 1904.	W								0	0	Normal pelvis; placenta prævia.	Recovered.	Died.		Primipara; placenta prævia centralis, 6½ months; cervix contracted; severe hemorrhage; baby lived few hours.
9	Dec. 4, 1904.	C	19.0	20.5	20.5	20.5	17.5	8.0	6.5	0	2 long and difficult; 2 dead.	Flat; generally contracted.	Recovered.	Lived.	7 lbs.	No record of length of labor; indications absolute.
10	Dec. 19, 1904.	W	24.0	27.0	2.0	22.0	20.0			40	0	Funnel-shaped pelvis.	Died.	Lived.	9 lbs. 4 oz.	Forceps failed; head in cavity; outlet contracted; pelvic inlet normal.
11	Mar. 18, 1905.	W	25.0	22.0			18.0	9.5	8.0	18	0	Simple flat pelvis.	Recovered.	Lived.	4 lbs. 12 oz.	Head could not engage.
12	Dec. 6, 1905.	C	22.0	23.0	18.0	19.0	17.0	9.0	7.0	16	0	Justominor.	Recovered.	Lived.	7 lbs. 12 oz.	Head could not be made to engage by pressure under chloroform.
13	Jan. 18, 1906.	W	21.5	25.5	20.5	20.5	18.0	6.5	5.0	0	0	Dwarf; absolute; generally contracted flat pelvis.	Recovered.	Lived.	6 lbs. 4 oz.	Elective operation.
14	May 25, 1907.	C	23.5	25.0	19.5	19.0	16.5	10.0	8.5	17	0	Generally contracted flat pelvis.	Recovered.	Lived.	8 lbs. 12 oz.	Forceps attempted; head could not be pressed into inlet under chloroform.
15	May 27, 1907.	C	21.0	23.5	20.0	19.5	16.5	8.5	7.0	21	1 dead baby.	Justominor.	Recovered.	Lived.	7 lbs. 6 oz.	Head not engaged and could not be pressed into inlet under chloroform.
16	May 27, 1907.	C	21.0	23.5	18.5	19.5	17.0	11.0	9.0	12	0	Justominor; head not engaged.	Recovered.	Lived.	5 lbs. 14 oz.	Head could not be pressed into brim under chloroform.
17	June 13, 1907.	C	20.0	22.0	18.0	18.5	14.0	8.0	6.5	20	0	Justominor; head not engaged.	Recovered.	Lived.	7 lbs. 4 oz.	Head could not be made to engage under chloroform; absolute.
18	Oct. 13, 1907.	W	25.0	28.0			20.5	10.5	9.0	3	3 high forceps: 1 alive, 2 dead.	Simple contraction; head not engaged.	Recovered.	Lived.	9 lbs. 12 oz.	Previous labors were difficult; axis traction forceps, and with babies dead.

Of the 18 operations reported in tabular form, 10 were on colored women, and 8 on white women. The 18 sections were performed within a period of eighteen years. Two were done within the first thirteen years of that period, and 16 in the last five years. The larger number of operations in the latter period is accounted for by the fact that the relative indications for performing Cesarean section have gradually been broadened to embrace those cases which were formerly submitted to high forceps and version. The results have shown no increase of danger to the mother and they have recovered without sepsis and lacerations of the birth canal. In regard to the infants, we notice this difference: living babies are now carried away by the mothers, and not dead babies by the undertaker. Of the 18 infants, 16 were viable, and 15 lived. Three of the cases of pelvic deformity (IX, XV, XVIII) had previously given birth to 6 infants—1 alive and 5 dead. The dead babies had been delivered by difficult high forceps operations. High forceps extraction in these cases at the Columbian Hospital has produced 7 dead infants in the last 20 operations, with a fœtal mortality of nearly 33 per cent.

The only viable baby lost was in Case IV. It weighed 5 pounds 13 ounces. The other 2 dead infants were 1 (Case VII) at the seventh month, weighing 3 pounds, removed by Cesarean section for a fibroid blocking the pelvis; and 1 (Case VIII) removed at six and a half months of pregnancy for placenta prævia centralis.

Thirteen of the women were primiparæ; 5 had previously given birth to children. Three have already been mentioned; 2 had had 2 babies each normally, because there was no pelvic deformity. They were Cases III and VII, who were operated upon for the result of a previous ventrofixation and for fibroid in the pelvis.

The indications for Cesarean section were absolute in 8 cases.

Of the 15 cases of pelvic deformity, the following classification was made: Justominor and flat, generally contracted pelves, 9; rachitic flat pelves, 3; simple flat pelves, 2; funnel-shaped pelvis, 1.

The fatal maternal case was in a primipara with a funnel-shaped pelvis. She had been in labor thirty-six hours, and forceps had been applied four times. My preference was for symphysiotomy, but the family requested Cesarean section. The woman was the wife of a naval officer, and it was desired to make her sterile, as subsequent pregnancies might occur at some point removed from skilled assistance. Death occurred on the third day from acute dilatation of the stomach. The baby lived.

The symptoms appeared soon after the patient was removed from the operating table. The pulse increased to 130 and the temperature to 101° the same evening. The next morning the abdomen was distended. Insertion of a rectal tube and high enemas gave no result. On the second day the bowels moved freely from hypodermic injections of eserine salicylate. There was little vomiting; some gas escaped by eructation. Calomel was given in small repeated doses;

food and stimulants were retained. On the third day the distention increased, the pulse became more rapid and feeble, and death occurred. The autopsy revealed the peritoneum clean and free from infection and the uterine incision healed. The intestines were empty up to within a few inches of the stomach, where the duodenum was found kinked or twisted longitudinally upon itself. The stomach was enormously distended. The use of a stomach-tube and postural treatment would most likely have saved the patient. The true condition was not recognized at the time.

Case XV of the series tabulated presented postoperative symptoms of a similar character, but was promptly relieved by washing out the stomach.

THE CLINICAL AND PATHOLOGICAL ASPECTS OF RODENT ULCER.

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In 1827 Jacob,[1] of Dublin, was the first to describe rodent ulcer as a distinct clinical entity, as did Lebert[2] in 1851. In 1865 Thiersch described very fully as a form of superficial carcinoma of the face that which for many years had been spoken of as rodent ulcer on account of its clinical course. Since his time the lesion has been much written about, both from the clinical and the pathological aspects. The clinical history in all cases is very similar. Bland-Sutton, J. C. Warren, Kaufman, and others who have written upon the subject, describe the condition in about the same words. The description given by Bland-Sutton[3] is concise and comprehensive: "In its common form, a smooth, rounded knob of about the size of a split pea is noticed on the skin of the face, either on the nose, eyelids, orbital angles or cheek. This knob may remain for years (seven, eight, or even twelve), and cause no inconvenience save unsightliness; then, without obvious reasons, it may ulcerate and destroy the surrounding tissues, involving all tissues in its vicinity—skin, muscles, fat, cartilage, eyeball, and bone—and producing horrible destruction of the bone, in some cases even destroying the base of the skull and the meninges and exposing the brain. To produce such terrible effects the disease requires five, ten, or even more years. In its course it destroys everything, never cicatrizes, and is painless. Although rodent cancer arises mainly in the facial situations already mentioned, it may occur on the neck and the pinna; it has been met

[1] Dublin Hosp. Reports, 1827.
[2] Traité pratique des maladies cancéreuses, Paris, 1851.
[3] Tumors, Innocent and Malignant, 1903.

with on the trunk, but never, so far as I know, on the limbs. It occurs most frequently in advanced life, but is not uncommon between thirty and fifty. It has been recorded at the age of twenty, but never before puberty (fifteenth year). It is more frequent in men than in women." Warren,[4] in describing the physical appearance of the rodent ulcer, says: "When discovered in the early stage of development it is found that the new formation has broken down in the centre, and an ulcer has formed. The ulceration is not deep, the surface is quite flat, and is surrounded by a pearl-colored rim. Around the edge of the ulcer the skin appears in a healthy condition. The absence of inflammation in the diseased part is characteristic of cancer. There is no red and infiltrated skin, as seen around tuberculous or syphilitic ulcers. The pearl color of the rim is due to the presence of epithelial cells, and it is characteristic of this form of cancer. When there is extensive breaking down of the tissues and inflammatory complications, the presence here and there of fragments of this pearly rim, perhaps made visible by the use of a hand lens, will enable the surgeon to recognize the disease under its disguise."

Although there is no disagreement as to the clinical features of the disease, the pathology of the origin of the condition has been much discussed. Thiersch[5] claimed that the rodent ulcer developed from the sweat glands, because he found proliferation of the cells forming the walls of the ducts, and some authors described it as an adenoma of those glands. Besides Thiersch, the sweat gland theory was upheld by Thin,[6] who claimed that he could trace every intermediate stage from normal duct to tumor growth. Norman Walker[7] also made similar claims, basing his views upon the character of the cells. According to Bland-Sutton, the following sources have been described as the origin: (1) Sebaceous glands; (2) sweat glands; (3) the hair follicles; (4) the outer layer of the root sheath of a hair; (5) epithelial remnants in the course of the facial fissures; (6) vestiges of the tear-pits of ruminants; and occasionally a hairy mole.

The sources that come most prominently under discussion are the sebaceous glands, the sweat glands, and the basal layer of cells of the squamous epithelium at any point in their distribution. Bland-Sutton, as a result of his investigations, ascribes the origin to the sebaceous glands. Warren, speaking of the epithelium, describes the cells as small and delicate, and reminding one strongly of those seen in the rete mucosum near the borders of the papillæ, or in the sheath of the hair follicles.

Some authors have considered this form of growth to be not epi-

[4] Surgical Pathology and Therapeutics, 1900.
[5] Epithelkrebs, namentlich der Haut, Leipzig, 1865.
[6] Cancerous Affections of the Skin, London, 1886.
[7] Trans. Path. Soc. London, 1894, v. 45.

thelial, but endothelial, in character. Braun[8] reported several cases, and advanced three reasons for considering these tumors to be other than carcinomas: (1) The cell formation; (2) the failure of connection of the tumor masses with the surface and its dependent structures (hair follicles, sweat and sebaceous glands); and (3) the lack of cornification. He says that "In the centre of the cell masses the individual elements are not infrequently arranged in concentric balls, without at any time undergoing cornification." Krompecher[9] investigated the three points above mentioned, and concluded that they were insufficient and that the growths belonged to the epithelial class. Borst[10] considers them to be endothelial, on the ground, especially, that they do not originate from the surface nor its appendages, but only secondarily grow into them.

Krompecher[11] advances the opinion that the above form of skin cancer develops from the lowest layer of the surface epithelium, the basal cells. This idea has been combated by Borrman,[12] who believes that the origin of these growths is in embryonal rests, and not from the basal layer of the epithelium. For that reason he refers to them as corium carcinomas, using the term to designate their location but not their origin. Krompecher,[13] in a reply to Borrman, briefly reviews his former work, and insists that the origin of most of these ulcers is from the basal cells. He repeats, however, his statement that in some cases there may have been a development from an embryonal rest. L. Noon,[14] from the examination of several rodent ulcers, concludes that to his mind there is very convincing evidence of their origin from the Malpighian layer of the epidermis near the necks of the hair follicles and from the reflection of this layer, which forms the outer root sheath of the hair.

The consensus of opinion at present probably is that these growths have their origin in some portion of the basal layer of cells. Believing that a general study of this form of carcinoma might prove interesting, 16 cases of this condition, as admitted to the St. Louis Skin and Cancer Hospital, were taken as the basis for this article. The clinical features of the individual cases are given in the following histories: but the general gross appearances and the microscopic findings will be taken up collectively later.

No. 302, J. M. B., aged forty years, male, white; admitted April 19, 1906. Tumor began about five years ago as a small nodule on the side of the nose. It ulcerated, became covered by a scab, and gradually increased in size. At present the growth is nodular, edges, which are sharply defined, are slightly raised. Is quite hard to the touch, and is about 1 cm. in diameter.

No. 466, J. W., aged sixty-one years, male, white; admitted Oc-

[8] Archiv f. klin. Chir., 1892, v, 43.
[9] Ziegler's Beiträge, v, 28.
[10] Geschwulstlehre, 1902.
[11] Der Basalzellenkrebs, 1904.
[12] Zeitschr. f. Krebsforsch, 1904, v, 2.
[13] Zeitschr. f. Krebsforsch, 1905, v, 3.
[14] Jour. Path. and Bact., Cambridge, October, 1907.

tober 17, 1906. Family history negative. Present trouble began about one year ago as a pimple behind the right ear. Various ointments and liniments were applied without any effect. The ulcer would frequently heal over, forming a scab, which, on removal, would cause bleeding. At present there is situated behind the right ear a small irregular, scab-covered ulcer, about 1.5 cm. long and 0.5 cm. wide. Is quite superficial, and has indurated edges.

No. 358, J. L. T., aged seventy-three years, male, white, service of Dr. F. J. Lutz; admitted July 11, 1906. Two sisters died of cancer of the breast. In 1889, eighteen years ago, a barber shaved off a mole situated on the left side of his chin. This remained an open sore, gradually increasing in size, until a year ago, when a scab formed over it. This was picked off, and since then the condition has gradually become worse. At present there is on the left side of the neck just below the jaw a sulcus about 4 cm. long, 1 cm. wide, and 0.5 cm. deep. This is covered with granulations, and the skin for a slight distance on both sides is somewhat infiltrated.

No. 364, J. S., aged forty-six years, male, white, service of Dr. H. G. Mudd; admitted July 26, 1907. About five years ago, without any apparent cause, an ulcer developed on the left cheek below the eye. At present it is a little over 1 cm. in diameter, and is covered by a scab.

No. 293, Mrs. W., aged thirty years, female, white, service of Dr. F. J. Lutz; admitted June 2, 1906. The growth was first noticed about four years ago. At present on the right side of the neck, below the mastoid process, there is a slightly depressed oval area about 1 cm. in length. The edges are slightly raised and indurated, but there is no ulceration.

No. 152, M. M., aged seventy years, female, white, service of Dr. N. B. Carson; admitted February 13, 1906. Present trouble began about five or six years ago, when the lower right eyelid became irritated by wild hairs. Patient said that the eyelid had been sore for three years, but that she did not notice any growth until three or four months ago. Examination shows the presence of an ulcerating growth, that has entirely destroyed the lower right eyelid. It extends from the inner canthus to the outer, then passes up around the external angle, and has destroyed about one-third of the upper lid. The lower conjunctival sac is also involved. The floor of the ulcer is covered by red granulations, from which there is a thin but somewhat purulent discharge. The edges of the ulcer are raised and indurated. The skin beyond the growth is not infiltrated to any extent (Fig. 1).

No. 39, Mrs. M., aged sixty-five years, female, white, service of Dr. F. J. Lutz; admitted November 15, 1905. The lesion was first observed seven years ago in the form of a wart at the inner canthus of the right eye. Since then it has gradually increased in size, until the lower lid and the orbital structures have become involved.

No. 110, J. E., aged fifty-four years, female, white, service of Dr. H. G. Mudd; admitted January 22, 1906. Present trouble began about twenty years ago, when she noticed a mole on her temple. This was constantly irritated by combing her hair, at which time it would bleed and then scab over. She frequently pulled off this scab, and the mole finally developed into an open sore. This slowly increased in size, and by last year the ear was destroyed. Examination shows a very large ulcerating area about 9 or 10 cm. in diameter. The floor of the ulcer is covered by red, raised, spongy looking granulations. The edges are raised, indurated, and somewhat nodular. The external ear is entirely gone, with the exception of a small piece about 2 mm. long and 1 mm. wide, that hangs down

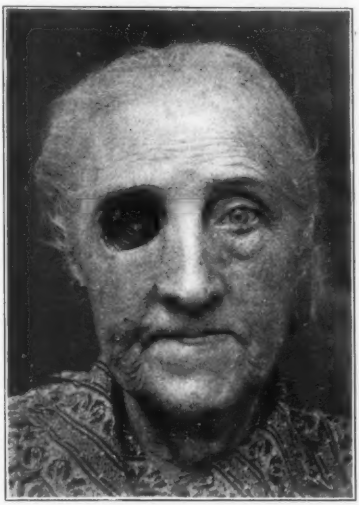

FIG. 1.—Rodent ulcer of the right ocular region (No. 152, M.M.).

and is attached by healthy skin. The external meatus consists of a large cavity lined by granulations. At the lower edge of the ulcer there is a distinct scar formation that would indicate a tendency toward healing. Some lymph nodes in the anterior chain near the angle of the jaw are palpable.

No. 229, F. J., aged fifty two years, male, white, service of Dr. N. B. Carson; admitted April 19, 1906. About three years ago the patient noticed a small area back of the left ear that would become slightly elevated, and where a scab would form, which would later come off. This became worse about one year ago, and since then has gradually increased in size. Examination shows the presence behind the left ear of an ulcerated area about 4 cm. long, of varying

diameter, and about 2 cm. deep. It involves the skin over the mastoid, the concha of the ear, and the external meatus. The edges are raised and indurated, but the surrounding skin is not infiltrated. The floor of the ulcer is covered by red granulations that bleed easily (Fig. 2).

No. 715, E. C., aged thirty-three years, female, white, service of Dr. N. B. Carson; admitted April 23, 1907. About ten years ago there was noticed a small node at the root of the nose. Caustics were applied without any beneficial effect. The ulcer gradually increased in size, until at present it is about 1 cm. in diameter, irregular in shape, and extends deep into the tissues.

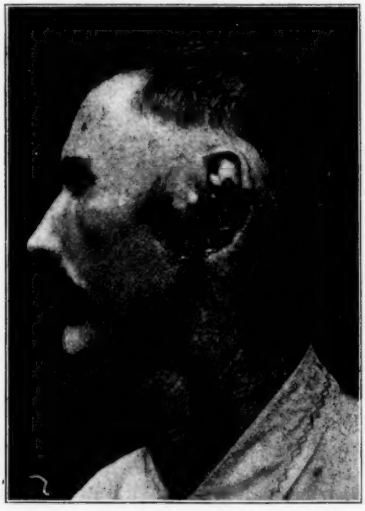

FIG. 2.—Rodent ulcer of the right auricular region, showing irregular but sharply defined edges (No. 229, F. J.).

No. 935, T. T., aged forty years, male, white, service of Dr. F. J. Lutz; admitted January 29, 1907. Some five years ago there appeared a small sore on the right side of the nose. This gradually increased in size, and three years ago the patient was operated upon, but the surgeon did not excise the entire growth, and the condition was simply aggravated. At present the ulcer has extended until it has destroyed the right side of the face. The right eye has been eaten away, as has been the right cheek, superior maxilla, and soft palate. The posterior nares, the remaining half of the hard palate, the pharynx, and the lower teeth are entirely exposed. Speech is almost impossible. During the four months the patient was in the hospital the ulcer steadily advanced, until death from exhaustion occurred on July 6, 1907 (Fig. 3).

No. 419, W. W., aged seventy-four years, mal , white, service of Dr. F. J. Lutz; admitted September 21, 1906. The present trouble began about fifteen years ago, when a pimple appeared on the left cheek near the angle of the mouth. This was cauterized, and remained apparently well for six years, when it returned. It was again treated, seemed cured, but again appeared in six years. Since then it has been treated spasmodically, but has gradually increased in size. Examination shows a superficial ulcer extending from the left corner of the mouth over the cheek for a distance of about 5 cm. The edges are irregular and brownish-red in color.

No. 907, Mr. T., aged seventy-five years, service of Dr. H. G. Mudd; admitted September 4, 1907. About three years ago there appeared what the patient thought to be a small mole situated below

FIG. 3.—Showing degree to which the destruction of tissues can progress (No. 935, T. T.).

the eye, near the nose. About three months ago this began to ulcerate slightly. At present the ulcer is about 1 cm. in diameter, the edges are somewhat elevated and everted, and are of a pearl color. Does not bleed easily.

No. 332, J. P. C., aged fifty-nine years, male, white, service of Dr. N. B. Carson; admitted June 26, 1906. In 1889, seven years ago, a barber cut off a mole situated on the right cheek over the malar bone. This place healed over, but later on was again cut off by a barber. After this it never completely healed. Was treated with caustics without effect. Examination shows an irregular ulcer with indurated edges, about 2 cm. in diameter, over the right malar bone. This is adherent to the deeper tissues, and the skin in the neighborhood of the ulcer is also adherent (Fig. 4).

The gross appearance of the ulcers in the foregoing cases is practically alike in all instances. The edges of the ulcer are slightly raised, indurated, nodular, and of a grayish color. There is, as a rule, no surrounding zone of infiltration or inflammation. The floor is covered with granulation tissue, and in one instance only, No. 110, is there any attempt toward scar formation and healing. Bland-Sutton states that the rodent ulcer "never cicatrizes," but in this case it had done so to a well-marked extent. Ulceration usually occurs comparatively early in the course of the disease, but in Case No. 293 the surface epithelium, although very much thinned in places, was still intact after four years. The microscopic structure is also so similar that a single description will practically suffice for

FIG. 4.—Rodent ulcer showing elevated and indurated edges, and nodules pearly gray in color (No. 332, J. P. C.).

all the cases. In thirteen of the specimens the formation of the cell nests is quite characteristic. Instead of the nests having regular margins, it is found that the usual arrangement is a markedly irregular papillary outline. These projections may be long, narrow, and pointed, or, as is more commonly the case, short, blunt, and finger-like, giving a peculiar rosette appearance to the nest.

The majority of the tumor cells contain rather long, narrow, spindle-shaped nuclei that, as a rule, stain quite deeply, although others are more vesicular, and stain less markedly. The cells seen in the central portion of the nests show no definite arrangement, other than finding here and there many of them lying in parallel rows. Those

cells, however, at the periphery of the larger nests show a distinct tendency to be arranged in a columnar fashion with the nuclei at right angles to the surrounding tissues. This was quite marked in 13 of the 16 cases examined and existed to a slight degree in the other 3.

In 9 specimens there was observed a quite well-marked network formation of the columns of cell nests. These interlaced and surrounded areas consisting of an almost transparent, finely reticulated tissue. No definite structures could be found in these areas, no cells or connective tissue fibers. The impression obtained is, however, that they may be remnants of sebaceous glands that have undergone degeneration. As all the specimens had been passed through alcohol and ether, no attempts were made to stain for fat granules.

In 2 instances there were areas of connective tissue enclosed in a network formation, while in the remaining 5 there was no such arrangement. In 4 of the cases there was found a very slight concentric arrangement of the cells, but in none was there any keratin or true pearl formation. Krompecher says that cornification is not so unusual, but Borrman in 80 cases saw it twice only and then very slightly. Mitotic figures proved to be quite numerous in 11 instances, although the durations of the growths varied from one year to twenty-four. In the other 5 specimens the mitotic figures were few. In 10 cases in which the surface epithelium was present it was considerably thinned over the growth, and the papillæ were either absent or much compressed and pushed aside. One specimen gave the appearance of the growth being in direct continuity with the surface epithelium. The distribution of the sebaceous glands was of interest. There were only 3 specimens in which even slight traces of the glands could be discerned in the area of the growth, although in 10 there were numerous sebaceous glands in the adjacent tissue. In No. 364 there was one area in which the strands of the tumor cells were found more than one-half surrounding a portion of a sebaceous gland. In 5 specimens these glands were not present. Sweat glands were present in most of the specimens in the tissues adjoining the growth. Round-cell infiltration was present in all the specimens, particularly along the advancing border of the growth, although it was found in varying degree in the central areas.

In a previous paper [15] I reported the findings concerning the elastic tissue in rodent ulcers from a study of 13 cases. It was found that in all of them there was marked fragmentation of the elastic tissue away from the growth as well as in it. The amount of the elastic fibers decreased greatly the farther away from the periphery, and in one specimen there were almost no fibers, notwithstanding the fact that there was an unusual amount of connective tissue surrounding the cell nests. In another specimen taken from deep in the tumor

[15] Jour. Med. Research, 1907, xvi, 7.

there was no elastic tissue present, not even in the small fibrous areas containing the capillary bloodvessels. A third slide showed an unusual amount of elastic tissue in the skin and surrounding the cell nests, but even in this one there was less elastin in the central portion of the growth. Five out of the 13 specimens also showed distinct evidences of the mechanical crowding together of the elastic fibers. In 6 of the 13 cases the duration of the condition was ascertained. The most recent was of three years' standing, the oldest twenty-four. No definite relationship between the duration and the amount of elastic tissue could be shown. In the three-year case there was more elastin than in any of the others, while in the one of fourteen years there was a large amount of connective tissue, but only a very few small fragments of elastin.

In taking up the clinical features of the above cases there is one point of particular interest, that is, the absence of infiltration of the lymph nodes. The rapidity of the growth or the degree of involvement seem to have no bearing. In only one case, No. 110, was any enlargement of the lymph nodes found. None of them were obtained for microscopic examination, so it is not possible to determine definitely whether or not the enlargement was due to malignant infiltration. As there was a very extensive ulceration in this case, it seems quite probable that the increase in size was the result of secondary infections. In No. 935, upon whom an autopsy was done, no infiltrated nodes were found, nor were there any metastases to distinct structures. This fact is one that would make it seem probable that early operation in the form of excision would often result in a permanent cure.

A number of the above cases were treated by the *x*-rays for varying periods, but there did not seem to be any permanently beneficial results. For a while the lesion would seem to improve, the skin close in to a slight extent, and the discharge become less. After a few weeks or so the patient would stop coming to the hospital and disappear for some months. The lesion would again break down and the patient once more return for treatment. Excision followed by the *x*-rays gave the best results.

The family history is of interest in only one case, No. 358, in which two sisters died of cancer of the breast.

The duration of the condition at the time of admission to the hospital varied from one year to twenty-four. The average period in the 14 cases in which the process had been watched from the beginning was a fraction over eight years for the two sexes—ten years in women, and a little less than seven in men.

If the age at which there was first noticed any trouble is taken, we find the following conditions: twenty to twenty-nine years, 2 cases; thirty to thirty-nine years, 3 cases; forty to forty-nine years, 2 cases; fifty to fifty-nine years, 5 cases; and sixty to sixty-nine years, 2 cases. This would indicate that the decade most prone to attack is that be-

tween fifty and fifty-nine years, although it is found to occur at much earlier periods. The youngest case was in a woman of twenty-three, and the oldest in a woman of sixty-five. The average age at which the growth began in 5 cases in women was forty years. In men, the earliest age at which a rodent ulcer began was thirty-five, the oldest was sixty, the average age in 9 cases being forty-nine.

The percentage as regards men and women in these 16 cases showed 62.5 per cent. in men, and 37.5 per cent. in women, which is just about the reverse of the figures when cancer generally is taken into consideration.

As far as location is concerned, 8 of the 16 cases began in the region of the eyes and the nose, particularly near the inner canthus, while of the others 3 appeared behind the ears or upon the neck, with the remaining 5 scattered over the face.

All of the 16 cases occurred in whites, none having been seen in the colored race.

The following table gives a summary of the 16 cases:

No.	Location.	Duration.	Age on Admission.	Sex.	Race.	Age when Growth Began.
302.	Side of face	5 years	40	M.	W.	35
466.	Behind right ear	1 "	61	M.	W.	60
358.	Left chin	18 "	73	M.	W.	55
364.	Left cheek	5 "	51	M.	W.	46
293.	Right side neck	4 "	30	F.	W.	26
152.	Right lower lid	5 "	70	F.	W.	65
39.	Inner canthus	7 "	65	F.	W.	58
110.	Temple	24 "	54	F.	W.	30
490.	Below left eye	....	55	F.	W.	..
14.	Inner canthus	....	52	M.	W.	..
229.	Behind ear	3 "	52	M.	W.	49
419.	Angle of mouth	15–20 "	74	M.	W.	55–60
907.	Inner canthus	3 "	59	M.	W.	56
715.	Root of nose	10 "	33	F.	W.	23
935.	Side of nose	5 "	40	M.	W.	35
332.	Cheek	7 "	59	M.	W.	52

ERYSIPELOID OF ROSENBACH.

A NOTE ON ITS OCCURRENCE IN LABORATORY WORKERS.

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My object in making this report is to place on record two cases of the interesting and somewhat unusual affection, known as erysipeloid of Rosenbach, which were contracted in an unusual manner, as well as to make mention of a third case, which, while not seen per-

sonally, had symptoms, as related to me, that were strongly suggestive of the disease. These three cases were all in scientific investigators or their assistants, engaged in studies in comparative and experimental pathology.

Case I.—E. G., a physician, in excellent health, pricked the ring-finger of the left hand, or infected a previously existing abrasion in that locality, while working with a mass of semiputrid pigs' snouts, from which he was making chrondrosulphuric acid to be used in the experimental production of amyloid disease. Within thirty-six hours he developed what appeared to a cellulitis of the end of the finger; and on the following day, December 9, consulted me. The appearance was that of an ordinary paronychial affection. It was incised, but no pus was found. The swelling and tension were relieved, and in a few days it was apparently well.

He returned to his previous work, protecting the finger in a measure by a finger-cot. Within twenty-four hours, December 14, he noticed a swelling of the finger near the end. This swelling was tense, dark red, and limited by a well-defined margin, without vesiculation or pustulation, and differed entirely from an ordinary cellulitis in appearance. I at once was able to make a diagnosis of erysipeloid. An ichthyol-ointment dressing was applied.

The infection spread slowly toward the base of the finger, accompanied with itching and burning, but without constitutional disturbance. Iodine was now applied around the infected area and beyond, but without effect in checking its spread. On the 19th it was noticed that it had spread to the palm of the hand. Lead-water and laudanum dressings were used. Three or four days later the swollen and red area began to fade.

The whole course of the infection was about fourteen days from the time of the first symptoms of cellulitis. It is possible that there were two infections of different nature, the erysipeloid being secondary to the primary cellulitis.

Case II.—Miss P., an assistant in the Laboratory of Comparative Pathology at the Zoölogical Gardens, and a young adult in good health, on October 28, 1907, while performing an autopsy on a cassowary that had died of acute enteritis, injured herself with a pair of scissors on the palmer surface of the left index finger while opening the intestine, but did not draw blood. Shortly afterward she washed the wound with carbolic acid and went on working. Later, she washed it with soap and water, lysol, and alcohol.

On the following day without protecting the abrasion, she made an autopsy on a Dorcas goat that had died of tuberculosis. On the evening of the same day she noted a swelling with inflammation at the site of the wound. There was no special pain. The inflammation travelled toward the base of the finger. The finger became red and swollen, and the seat of burning pain. She applied a poultice, and the inflammation receded toward the tip of the finger. On the

31st it returned to the middle phalanx. She continued the poultices for three days, when the dressing was changed to hot carbolic solution, 1 to 100. Later, hot bichloride lotion was used.

When I saw her, on November 5, 1907, the finger was swollen and slightly reddened. There were signs of an old abrasion over the second joint. The swelling was most marked at the proximal phalanx. The skin had been somewhat bleached by the hot, moist dressings. There was slight tenderness, but only a little pain; slight œdema, but no fluctuation. The temperature was 99.4°. There had been headache and slight feverishness the previous evening. A diagnosis of erysipeloid was made, and lead-water and laudanum was applied.

Two days later the swelling and redness were around the base of the finger, and had spread in the characteristic manner to the palm, with the usual well-defined margin marking the progress. There was a small blister on the dorsum of the finger, near the base —probably due to the applications used. An ichthyol dressing was applied. Cultures were made from the fluid in the blister by Dr. Herbert Fox, on glycerin-blood agar, saccharose agar, and glucose agar. The cultures failed to show a growth.

November 9, two days after this, the inflamed area had faded. There was no more pain. Burning and itching had been the most prominent symptoms. Three days later, November 12, it was noted that the inflammation had gone back to the end of the finger, which was red and swollen, with some throbbing, itching, and burning. After this the condition quickly subsided; and three days later she was practically well.

Case III.—Dr. H. F., a young adult in good health, detailed to me, in a personal communication, the following history:

On the day before infection developed he had made a postmortem on a bird whose species he could not recall. He did not remember having had any break in the continuity of the skin. Infection began in the first phalanx of the thumb, which in eighteen hours became swollen, red, and tender, as well as somewhat stiff. Twenty-four hours later the inflammation had spread to the thenar eminence, which was swollen and painful, and also itched and burned. The first region affected was less painful. The following day the inflammation returned to the starting point, travelling thence to the distal phalanx. On about the tenth day the proximal phalanx again became swollen and inflamed. It was incised, but no pus was found on deep incision. There was, however, said to have been a small necrotic area. The wound was not packed. A wet dressing was applied, and it healed in about a week. The temperature was not taken at any time, but he thought that he had slight fever.

Erysipeloid of Rosenbach (also known as erythema migrans, erythema serpens, reticular lymphangitis, and crab cellulitis) was

first clearly described by Morrant Baker in 1873, under the name of erythema serpens. Tilbury Fox, three years before, had placed on record two cases of what were perhaps examples of this disease; although the infection was derived not from animal matter, but from kid shoes in one case, and from clothing in another.

Erythema serpens, as described by Baker, was an infection of the hands that he observed in the butchers of the Smithfield meat markets. His description of the manner of infection, the general appearance, the tendency to spread, the self-limited course, and the absence of severe constitutional symptoms correspond closely to what we now recognize as erysipeloid. There were some minor differences, such as the exact color of the lesion, the shape of its margin, etc. Rosenbach[1] described the condition, gave to it the name that it now commonly bears, erysipeloid; pointed out the manner of infection, the common infecting agents, and the classes of persons exposed; described its clinical symptoms and course; and made certain bacteriological studies. Following him, Elliott, Cordua, Felsenthal, and Delbanco reported cases or made studies in the etiology. Finally, Gilchrist published a very large series of cases, with clinical, pathological, and bacteriological observations.

Briefly, erysipeloid is an erythematous inflammation, somewhat resembling erysipelas, observed usually on the hands of persons engaged in handling animal products that are liable to putrefaction and decay, especially, fish, shell-fish, meats, poultry, and cheese. Hence it is commonly encountered in dealers in fish, game, and poultry, butchers, and cooks.

A large number of the reported cases (323 of the 329 reported by Gilchrist) are due to crab-bites, or to lesions produced by handling crabs. This type differs slightly, if at all, from that resulting from infection from dead animal matter. The explanation that has occurred to me is that the crab, as is well known, is a feeder on decomposing animal matter. As crabs are handled in the market, they are likely to be contaminated by such matter; and, as the crab does its biting with its hands, as it were, with which it also handles its food, organisms may readily be conveyed thereby. It is not necessary to suppose, as does Gilchrist, the presence of any special ferment in the crab.

The only reported cases in which infection had been contracted in a manner similar to that in the cases herewith reported are those mentioned by Shepperd.[2] He stated that he had seen several cases in medical students, contracted from scratches in the postmortem or dissecting room. At least, this is the only reference that I have found to inoculation in members of our profession.

Cases of this disease are of comparative infrequency; or, at least,

[1] Mikroörganismen beidem Wund-Infektionskrankheiten, Arch. f. klin. Chir., 1887.

[2] Discussion on Gilchrist's paper before the American Dermatological Association in June, 1904.

in the ordinary experience of dermatologists. Only four cases were observed in one year in Unna's entire clinic. The remarkable experience of Gilchrist and his associates at Johns Hopkins Hospital, whereby he was able to report 329 cases, is explained by the fact that 323 of those were lesions contracted in the handling of crabs. The prominence of Baltimore as a crab-handling community need only be mentioned as a rational explanation. The dermatologists with whom I have conversed have seen a very limited number of cases.

That they are not more frequently reported admits of two explanations: one, that they are comparatively rare; the other, that they are frequently overlooked. My attention was first directed to this disease some years ago, while working in the surgical dispensary of the Episcopal Hospital, where I saw a small series of cases, mostly in handlers of fish and shell-fish. It is probable that in surgical dispensaries, at least, they are usually looked upon as variations of ordinary cellulitis. At the same time, it must be admitted that they are comparatively rare.

The infection takes place through a break in the continuity of the skin. Several points of inoculation are occasionally observed. The incubation period, according to Gilchrist's observations, averages two days. It may develop after a few hours, however, and rarely is delayed for several days or a week. It appears as a swelling with elevated, sharply defined edges, which soon affects the entire circumference of the finger; and is commonly described as of a dark-red color, with purplish, or even livid, edges. The finger is tense and only moderately painful, but itching and burning are prominent symptoms. Sections of tissue excised show an inflammation of the entire corium and, to a slight extent, of the subcutaneous tissue, with infiltration of polynuclear leukocytes and small lymph cells; œdema of the epithelial cells of the epiderm; and inflammatory changes, especially marked around the sweat-glands and blood-vessels (Gilchrist). It has a characteristic tendency to spread from its usual point of origin, near the end of the finger, toward the palm, the primarily affected area fading from red to yellow, and thence to normal. Reaching the palm, it may spread over it; but commonly, it soon affects the neighboring finger; and, when untreated, it may gradually spread to all the fingers and to the back of the hand. There is no fever, or other constitutional disturbance, and the lymph glands are almost never involved. It is more or less self-limited, commonly lasting from ten days to three weeks; and during this time there is a well-marked tendency to relapse. There is no suppuration, pustulation, or vesiculation; and no scaling follows.

Rosenbach obtained an organism that grew on gelatin at a low temperature. In its early stages it resembled a staphylococcus, being somewhat larger and in the shape of irregularly rounded and long bodies, which were the first stages of a thread-producing micro-

organism. This later developed as numerous tangled threads of irregular length, very slender, arranged now irregularly, and again in spirals, and forming a thick, tangled mass. It resembled a cladothrix. Inoculations of this organism in the human subject produced, according to Rosenbach, a typical lesion at the end of forty-eight hours.

Following Rosenbach, Cordua and Felsenthal confirmed Rosenbach's theories as to causation by a specific germ, a cladothrix; while Delbanco, working in Unna's clinic, failed absolutely to obtain the organism. Gilchrist reports the results of investigations by Finney, Wright, Abbott, Livingood, and himself. Their results, in a series of most carefully conducted histological and bacteriological studies, were absolutely negative. While credence is given to Rosenbach's views regarding the causation of erysipeloid in some text-books, it is evident that his experiments were conducted so long ago and that his results have so frequently failed of confirmation that one may be pardoned for looking askance at them. That erysipeloid is due to a specific infection is strongly indicated. The manner of infection, the pathological findings, and the clinical course are scarcely explainable on other grounds. But it certainly cannot yet be said that the specific germ has been demonstrated.

Erysipeloid is commonly said to require differential diagnosis from erysipelas, ringworm, and eczema; but a consideration of its local nature, the manner of infection, the clinical appearance, and the self-limited course will usually suffice to separate it from cases of the other affections mentioned. In a few instances it may be difficult to distinguish erysipeloid at its onset from an ordinary cellulitis due to pyogenic infection. In such a contingency, observation for two days will usually enable one to draw a distinction.

A number of methods of treatment have been tried. Gilchrist claims the best results from the use of Unna's salicylic-acid plaster in 25 per cent. strength, applied over and beyond the infected area, and covered with ordinary adhesive strips. In other cases, pressure with adhesive plaster alone sufficed to cure. The injection of carbolic acid, 1 to 20 to 1 to 30, around the edge, soaking in bichloride solution, applications of tincture of iodine, ichthyol ointment, and lead-water and laudanum, have all been used. I have thought that tincture of iodine, painted around and beyond the advancing margin, had sometimes an influence in checking the spread of the condition. I have found lead-water and laudanum, and ichthyol comfortable and soothing dressings. Gilchrist's results with salicylic plaster exceed any that I have obtained by other means.

THE SYMPTOM COMPLEX OF TRANSVERSE LESION OF THE SPINAL CORD AND ITS RELATION TO STRUCTURAL CHANGES THEREIN.

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Elsewhere[1] I have discussed the pros and cons concerning laminectomy in cases of fracture-dislocation of the spinal column. In studying the literature on this subject one is struck with the absolute impossibility of being able to determine definitely in many cases, within any reasonable time, whether the spinal cord has been irrevocably destroyed as a conductor of afferent and efferent impulses. Many investigators, chiefly surgeons, hold up the fact that a patient with a fracture-dislocation showing symptoms of complete transverse lesion occasionally will recover in the course of time, regaining a fair amount of power and usefulness in the lower limbs. Upon such a history they base their arguments as to the possibility of regeneration in the spinal cord when it is badly crushed. The next step in such logic is, that if such a patient can occasionally get well without laminectomy how many who die without this surgical procedure would have lived had their spinal canal been opened, clots and spicules of bone removed, and the cord given a chance to bridge with functionating nervous tissue the area of traumatic softening.

Now, let us keep before us this important fact: The neurons of the central nervous system, when acted upon by toxic agents or physically injured by factors either from without (concussion, fracture-dislocation, etc.) or from within (pressure of tumors, exudates, etc.), although structurally damaged, yet are able to exhibit, up to a certain point, an autorestoration, provided the factor or factors causing this condition have been removed or ameliorated.

Literature is not wanting in cases presenting symptoms of grave transverse involvement of the spinal cord the histological examination of which discloses little and insignificant structural changes. Gordon Holmes[2] reports 3 such cases which were the result of the collapse of tuberculous vertebræ with consequent pressure on the spinal cord. A fourth case in the same contribution was one of glioma of the pons. The paraplegia and sensory disturbance were so ex-

[1] Injuries of the Spinal Cord, Jour. Amer. Med. Assoc., March 21, 1908.

[2] On the Relation between Loss of Function and Structural Change in Focal Lesions of the Central Nervous System, with Special Reference to Secondary Degeneration. Brain, 1906, iv. 514.

treme in the tuberculous cases that one would have been warranted in expecting to find a practically complete destruction of the spinal cord at the level of the bone lesion, with pronounced secondary ascending and descending degeneration. In 2 of the cases the paraplegia was present for about one year before death, in 1 case for five months. The microscopic examination of the segments involved revealed but a very moderate change, and above and below the site of the lesion there was no secondary tract degeneration found by the Weigert or the Marchi method. The fourth case presented at first a right hemiplegia, and with the further growth of the neoplasm a complete paralysis in all four extremities obtained for one month before death. Here, again, the histological examination failed to discover any secondary degeneration.

Holmes argues that the loss of the medullary sheath at a given point is liable to render the axis cylinder non-conducting, but does not necessarily entail the secondary degeneration above or below, as the case may be. Therefore, in such a case one might examine Weigert or Marchi preparations functionally distal to the lesion, and find a normal or almost normal condition of affairs, whereas in reality the tract at the point of injury would be minus the myelin sheaths and not a conductor of impulses. He cites the findings in disseminated sclerosis to support this view. In this disease there is a loss of myelin for a short distance only, with preservation of the axis cylinders, and yet a total break in the conducting ability of the fibers. In other words, he infers that the myelin is necessary to conduction, that its removal does not affect the anatomical integrity of the axis cylinders or its perikaryon. From these premises he draws the conclusion that reparative process would be possible.

This reasoning of Holmes is all that could be desired, until he comes to drawing the parallel between the non-conductivity of bare axis cylinders and disseminated sclerosis. In disseminated sclerosis, although a tract of axis cylinders bereft of their medullary sheaths remains to the end without medullary covering, the symptoms due to non-conduction of impulses in this area of the cord frequently pass away and there is every evidence that the nerve fibers in this area are functionating normally or almost so.

Schlagenhaufer[3] reports a case in which an endothelioma of the dura mater situated at the edge of the foramen magnum pressed upon and grossly distorted the upper cervical segments of the spinal cord and the medulla oblongata. The duration of this growth was one year and four months, and before death the patient presented a complete paralysis of all four extremities, as well as of the bladder and rectum. Complete anesthesia of the four extremities and the trunk was also present. Although there was pronounced change in

[3] Ein intradurales Endotheliom im Bereiche der obersten Halssegmente, Arbeiten aus dem Neurologischen Institut, a. d. Weiner Universität, 1902, viii, 88.

the second and third cervical segments (alle Stadien einer Compressionsmyelitis), yet secondary degeneration was conspicuous on account of its absence.

Bielschowsky,[4] in a painstaking investigation of axis cylinders when involved in tumor formation or in compression of the spinal cord, also thinks that they have the power to regenerate. His conclusions are interesting when compared with those of Ballance and Stewart[5] who were the sponsors in large measure for the neurilemma-nuclei theory of axis-cylinder regeneration. Bielschowski found in the outer zone of infiltrating tumors of the central nervous system, as well as in the compressed level of the spinal cord, naked axis cylinders which had been interrupted in their course by the pathological process, but were still in unbroken communication with their perikaryons. At the ends of these axis cylinders there were fine fibril-like prolongations ending in a peculiar oval-shaped structure not unlike the terminal organ of Held. On account of their oval shape and light centres he speaks of them as *Ende Ringe*. He considers these long, fibrillar prolongations the products of regeneration. The absence from the equation of neurilemma nuclei is noteworthy, and the fine, newly formed bloodvessels are supposed to exert the chemotactic influenee and to prepare the path for the newly formed nerve fiber which clings to its outer surface, showing here the expanded end-bulbs.

Ballance and Stewart[6] say: "The more the specimens are studied the more is the conclusion forced upon the mind of the observer that for the regeneration of a peripheral nerve fiber (not only the axis cylinder, but also the medullary and neurilemma sheaths) the activity of one variety of cell, and one variety only, is responsible. That cell is the neurilemma cell." These investigators further submit that the reasons we do not have any regeneration in the axones of the central nervous system is that in this locality there is an absence of neurilemma nuclei.

Marinesco[7] holds that there is no *régénérescence autogène* in the sense that there occur islets of new-forming axis cylinders and medullary sheaths in the distal part of a divided nerve. He thinks that the new nerve fibers in the distal part are prolongations from growing tissue in the proximal end. In speaking of experimental cases in which nerves were divided and their proximal portions removed, microscopic examination later demonstrating newly formed fibers in the distal portion, he evidently does not consider that he weakens his theory by naively stating: *De pareils cas sont d'autant*

[4] Ueber das Verhalten der Achsenzylinder in Geschwülsten des Nervensystems und in Kompressionsgebieten des Rückenmarks, Jour. f. Psychol. und Neurol., 1906, vii, 101.

[5] The Healing of Nerves. Macmillan & Co., Ltd., 1901.

[6] Loc. cit., p. 89.

[7] Etude sur le mécanisme de la régénérescence des fibres nerveuses des nerfs périphériques, Jour. f. Psychol. und Neurol., 1906, viii, 140.

plus difficiles à interpréter que les cellules d'origine du bout arraché sont complètement atrophiés.

The raison d'être of this seeming digression from the title of this paper lies in the presentment of the leading thoughts on the subject of nerve regeneration. It makes a considerable difference in the way we view trauma and tumor involvement of the central nervous system if we accept the opinion of Bielchowski. As I have said, we have to admit a capability on the part of the central neuron of autorestoration (not the régénérescence autogène which Marinesesco denies); likewise, it seems to me that it is axiomatic that the nerve cells and their processes, axis cylinders as well as dentrites, in the central nervous system must be amenable to the same laws of wear and tear and death that govern cells elsewhere in the body. The large, pyramidal cells of the motor cortex, for example, are limited in their length of life, and when their usefulness is past, phagocytic action removes them and their work is assumed by others. Such a theory presupposes a constant appearance of new neurons. The supply of the perikaryon might be from the development of the many small and insiginficant somatochrome cells with which the gray matter throughout the central nervous system is studded. But the axis cylinder cannot be so easily accounted for unless we accept the idea of the growth from the cell body. The evidence seems to point to the fact that a limited amount of regeneration in the central nervous system is possible after trauma under favorable conditions. But this regeneration is too insignificant to be of functional importance.

Through Dr. Spiller's kindness I have been enabled to study the spinal cord of a case which was in his service in the Philadelphia General Hospital, and which bears interestingly on the question of slight structural changes accompanied by grave symptoms. The case is one of 11 embodied in a paper by Spiller and Weisenburg.[8]

The patient, a woman, aged about forty years, ten months after the removal of her left breast for carcinoma, began to suffer from radiating pains across her chest and back, as well as in the lower limbs. One month after the onset of these symptoms she suddenly became paralyzed in her lower limbs, and was confined to her bed. She complained of a girdle sensation, but did not suffer extreme pain. The upper limbs were not involved. There was no motion whatever in her lower limbs, which were the seat of flexor contractures, the thighs on the abdomen, the legs on the thighs. The patellar and Achilles tendon jerks could not be elicited. Babinski reflex was present on both sides. Sensation for touch and pain was lost in the lower limbs and trunk up to a line three inches below the umbilicus. Occasionally pin prick would be recognized on the

[8] Carcinoma of the Nervous System and the Report of Eleven Cases, Jour. Nerv. and Ment. Dis., August, 1906.

dorsum of each foot. Incontinence of urine and feces was present. She died almost two months after the onset of her paraplegia, and therefore sufficient time had been given for secondary degeneration. The diagnosis of vertebral carcinoma in the thoracic region was ratified at the necropsy.

In studying the spinal cord microscopically, I expected to find very well-marked degeneration and wholesale destruction of tissue through pressure. Sections were made at intervals from the third thoracic segment down to and including the first lumbar segment and stained by the Weigert hematoxylin as well as the hemalum-acid fuchsin methods. To the unaided eye there was none of that yellowish color in the Weigert sections which betokens degeneration. Under the microscope there were seen comparatively few swollen axis cylinders and swollen medullary sheaths in the lateral and posterior columns. There were also found here and there a few spaces from which it appeared that axis cylinders had dropped. There was a moderate number of granular cells. The chief point of interest is that the spinal cord which appeared so little altered even microscopically had in reality ceased to be a conducting mechanism.

I think that we are justified in assuming that had this condition been caused by a fracture-dislocation instead of a rapidly increasing malignant growth, the patient, in course of time, would have shown some return of function, which would have been ascribed by certain observers to regeneration after complete transverse lesion.

It is, indeed, remarkable that the spinal cord can so completely suspend its function, at the same time presenting so slight evidence of organic change. And it should make us particularly careful in giving a positively bad prognosis as to return of function in cases which have presented for some months symptoms of complete transverse lesion.

REVIEWS.

LIGHT AND *X*-RAY TREATMENT OF SKIN DISEASES. By SIR MALCOLM MORRIS, F.R.C.S. (Edin.), and S. ERNEST DORE, M.D. (Cantab.). Chicago: W. T. Keener & Co., 1907.

THIS little book is the best summary, thus far published, of the modes of application of the various forms of "light treatment," of their modification, of the cases to which they are or are not adapted, and of the results that have been attained by their use. This is followed by a full consideration of the therapeutic properties of the *x*-rays, the authors restricting the term "light treatment" to that involving the employment of the chemical or actinic rays, that is, the blue, visible violet, and ultra-violet rays, or, in other words, the therapeutically active rays. The small proportion of yellow and green which may take part in the effect may be neglected. With the red and infra-red, or heat rays they were not concerned, except in regard to excluding them from acting upon the skin.

The underlying principles on which the so-called "Finsen" light treatment rests are: (1) Light, and especially the actinic rays, is a stimulant of organic life. (2) These rays can cause a genuine dermatitis. (3) They are bactericidal, and this action increases in direct proportion to the degree of concentration of the rays. (4) Light can penetrate the skin, as is shown in "trans-illumination." (5) The evidence as to the protective value of pigmentation in animals, the results of the exclusion of the chemical rays in variola, and the microscopic tissue changes caused by light constitute collateral testimony to its possible power as a therapeutic agent.

As to the results in lupus, the authors' summary is most interesting. When a general infection is present, the whole mass of blood containing the bacilli and multiple foci developing, the light treatment is powerless. When the disease is limited to a small patch, and does not penetrate deeply into the tissues, Finsen's method is decidedly superior to any other, for the lupous tissue can be destroyed without pain or subsequent scarring. Even when the patch is extensive it often yields without the disfigurement caused by caustics or the knife, and without the local hypervascularity often following the *x*-rays. When the disease is rapidly spreading, the destructive action of the light, to which only a very small area can be exposed at a sitting, is altogether insufficient to keep pace with its advance.

In such circumstances Finsen's method requires to be supplemented by the *x*-rays, which can be applied to the whole or a large part of the affected surface.

In fact, in all the authors' cases, except those in which the patches were small and superficial, the two agents were used in combination. They say: "It is in cases in which the face is the seat of non-ulcerated lupus of limited extent, and especially when no previous treatment has been employed, that light is most effective. When the greater part of one or both cheeks is invaded, the *x*-rays should be used. Much time may, as we have had occasion to observe, be lost by attempting to treat extensive patches by Finsen's method alone."

In ulcerating lupus the *x*-rays were usually very serviceable, while the light was often ineffective. In rodent ulcer in the pre-ulcerative stage and of small size—up to an inch in diameter—the results of the combined treatment, or of *x*-rays alone, were satisfactory, though in the majority there were slight relapses before permanent cure was obtained. In the fully ulcerated cases and in those with deep penetrations (to periosteum, or bone, or mucous membrane) healing was still procured, but in most of them small foci remained and tended to enlarge. Radium was then found useful.

In carcinoma, except as to the relief of pain and lessening of discharge, the *x*-rays in their hands, as in those of most others, have been disappointing. In cancer, therefore, and in sarcoma and Paget's disease as well (on account of the danger of delay), they should be a last, not a first resort. In keloid they think *x*-rays "worth a trial." The results in many other diseases (most of them more purely dermatological) are recorded in an interesting and instructive manner.

The authors' conclusions as to the whole subject may be unreservedly subscribed to: that "Finsen has made a most valuable addition to our therapeutic resources in dealing with certain diseases of the skin, but that, like every other remedy, his method is neither infallible nor free from serious drawbacks. The same thing may be said of the *x*-rays, and still more emphatically of other methods, such as high-frequency currents, radium, etc. But used in combination, with special adaptation to special conditions, they give results which a few years ago would have been altogether beyond the reach of medical art." J. W. W.

ABDOMINAL HERNIA, ITS DIAGNOSIS AND TREATMENT. By W. B. DE GARMO, M.D., Professor of Special Surgery (Hernia) in the New York Post-Graduate Medical School and Hospital. Pp. 458; 225 illustrations. Philadelphia and London: J. B. Lippincott Co., 1907.

FROM an experience with abdominal hernia extending over a period of twenty years or more, and embracing in all over 1400

operations for its relief, Dr. DeGarmo has written this book for the family physician. He has confined himself almost entirely to statements of accepted facts, has simplified both the anatomical and the purely surgical discussions as much as was possible, and has thus produced a text-book, which in spite of its occasional tendency to diffuseness and garrulousness, is a valuable and largely original contribution to surgical literature.

Probably the most valuable portions of the work are those dealing with the mechanical treatment of the various forms of hernia. This does not imply that the author is partial to the use of a truss. On the contrary, he urges that operative treatment for the cure of the deformity be adopted in every case unless such a course is positively contra-indicated; but he is rightly of the opinion that the physician or the surgeon, rather than the instrument maker, should select and should personally see to the adjustment of some form of efficient and comfortable support for this small minority of patients. Most surgeons will find a perusal of these chapters profitable. He says fully 95 per cent. of inguinal herniæ in infancy can be cured by a truss, provided it fits properly when applied, and is changed from time to time as the patient grows. He thinks nearly all cases of umbilical hernia in patients under five years of age can be cured by suitable support.

While no attempt is made to discuss internal herniæ, which the author thinks belong rather to intestinal surgery, he has not neglected the various complications of external herniæ. Among these may be mentioned misplaced testicle; interstitial hernia; the presence in the sac of the bladder, ovary, uterus, appendix, etc. By "sigmoid" and "cecal" hernia, he understands not the presence of those portions of the bowel in an ordinary sac, but a retroperitoneal hernia in which the structure involved has slipped down into the inguinal canal or the scrotum.

After discussing inguinal, femoral, and umbilical herniæ, short chapters are devoted to ventral hernia, and to such rare forms of hernia as lumbar, obturator, sciatic, vaginal, perineal, etc. Strangulated hernia is last discussed. He holds that "taxis," if tried by the physician first called, should not again be attempted by any other surgeon, no matter how skilful he may be, as it will be impossible to know the extent of the damage done by the first. Even moribund patients should be operated on, without any anesthetic in the worst cases; he reports several patients thus rescued from the grave. He reports 43 operations for all forms of strangulated hernia, with 9 deaths, including 1 death among 28 operations for strangulated femoral hernia. He states that among 110 operations for the radical cure of femoral hernia, there was only one recurrence noted. Two other supposed recurrences proved to be only subperitoneal lipomas. It is not stated how long the patients were traced.

Although there are included some rather extraordinary illustrations, yet further study of the volume removes the unpleasant impression received at first sight. A. P. C. A.

TRYPANOSOMES AND TRYPANOSOMIASES. By A. LAVERAN, Membre de l'Institut et de l'Academie de Médecine, Paris, and F. MESNIL, Chef de laboratoire à l'Institut Pasteur. Translated and much enlarged by DAVID NABARRO, M.D., B.Sc., D.P.H. Lond., Royal Society Commissioner for the Study of Sleeping Sickness in Uganda, 1903. Pp. 520; 81 figures in the text; one colored plate. Chicago: W. T. Keener & Co., 1907.

WHEN Laveran and Mesnil published their book upon trypanosomes in 1904, it contained practically everything that was known at that time about the subject; but so great has been the extent of research upon these organisms and so important the results of these researches in the last few years, and indeed months, that Dr. Nabarro, in order to bring the book up to date, was obliged to make numerous additions to every chapter. He very wisely has not attempted to edit the book, but has translated the original as it stood and has always enclosed his additions in brackets. Owing to this fact we have a good translation of the original French edition with additions which are exceedingly valuable and today absolutely necessary. By incorporating this new material Dr. Nabarro tells us that he has increased the book to more than one-half its original size.

To those who are at all interested in trypanosomes, Laveran and Mesnil's book must be very familiar, so that it is only necessary to give some idea of the book as it stands in this English edition. The arrangement has not been altered, though one entire chapter, on treatment, has been interpolated, and follows the section on human typanosomiasis. In the earlier part of the book, Nabarro has added discussions upon the relationship which spirochetæ and the Leishman-Donovan bodies bear to the trypanosomes. These disputed questions he leaves open. Other important additions are paragraphs upon several new forms of trypanosomes, the occurrence of flagellates in tsetse-flies, mosquitoes, etc., and the possible relation of these parasites to the sexual forms of the trypanosomes of the vertebrates, and the pathology of sleeping sickness. But it is almost impossible, in a few words, to give any idea of the additions, for new matter is to be found on every page of the book. The bibliography is practically complete up to the time the book was published, so that as a work of reference it is invaluable. W. T. L.

PROGRESSIVE MEDICINE. A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES, AND IMPROVEMENTS IN THE MEDICAL AND SURGICAL SCIENCES. Edited by HOBART AMORY HARE, M.D., Professor of Therapeutics in the Jefferson Medical College. Assisted by H. R. M. Landis, M.D., Demonstrator of Clinical Medicine in the Jefferson Medical College, Philadelphia. Vol. I, March, 1908; pp. 284; 11 illustrations. Philadelphia and New York: Lea & Febiger, 1908.

THE first section of the March, 1908, issue of *Progressive Medicine* consists of an exceedingly valuable discussion of recent advances in the surgery of the head, neck, and thorax, by Charles H. Frazier. Especial interest and importance pertain to the discussion of the surgery of the brain, both of which are increased by personal comments by Dr. Frazier, based upon considerable experience. Among many important subjects discussed in the 116 pages are tumors of the brain, traumatic lesions of the brain, trifacial neuralgia, tumors of the face and tongue, tuberculosis of the glands of the neck, cervical rib, diseases of the thyroid, carcinoma and other tumors of the breast, surgery of the lungs, empyema, bronchoscopy, surgery of the œsophagus, and surgery of the heart. Dr. Robert B. Preble contributes an interesting section of 46 pages on the infectious diseases, including plague, cerebrospinal fever, diphtheria, dysentery, influenza, malaria, pneumonia, rheumatism, scarlet fever, tetanus, tuberculosis, and typhoid fever. Dr. Floyd M. Crandall contributes a section of 30 pages on diseases of children, including various disorders of the newborn, disorders of digestion, infant feeding, etc. Dr. D. Braden Kyle contributes a section of 43 pages on diseases of the nose and throat, and Dr. Arthur B. Duel a section on diseases of the ear. The volume as a whole will well repay careful reading. A. K.

ELECTROTHERAPEUTICS AND RÖNTGEN RAYS. By MIHRAN KRIKOR KASSABIAN, M.D. Pp. 545. Philadelphia and London: J. B. Lippincott Company, 1907.

THE object of this book, as indicated by the author, is to present the important facts pertaining to electrotherapeutics and the Röntgen-rays. He begins by giving a short historical sketch of the use of electricity, which is followed by an exposition of the elementary principles of electricity and magnetism. He then goes into the nature and properties of electricity, giving definitions, and explains in detail the static, galvanic, and faradic currents, the instruments used, and the methods of application. He then discusses the uses

of the different forms of currents, both for diagnosis and the practical applications in diseased conditions.

There is no subject which lends itself more to charlatanism than electricity, and we are constantly surrounded by men who use it as a means for illegitimate practice. It is important, then, to have a work which clearly states the proper uses of this mode of treatment; and, as the author states in his preface, there is no one book which tells the general practitioner which current, how and when to use it, in any and every given condition. This is not the fault of the text-book writer, but is true because no one man can possibly know how to treat every form of disease, even though he spends his entire time in electrotherapeutics.

The author, who makes a specialty of Röntgen-ray diagnosis and therapy, gives us a short and brief exposition of the use of electricity in every possible disease, and in the majority of instances he quotes others. It is true he has been careful in his selection of those whom he quotes, but in spite of it many errors have crept in. The truth of the matter is that no one is qualified to write a general book on electrotherapeutics, for this branch, more than many others, lends itself to specialism. The man who treats nervous diseases electrically cannot and does not know the value of electricity in gynecology or skin diseases. In this book, for instance, the author quotes that Prof. Leduc has cured tic douloureux by three séances of electrolytic introduction of salicylic ions. Again, when talking of the treatment of hemiplegia, he states that "vigorous electrization of the affected limbs may completely restore them; further efforts may be directed to the cranial lesion by the application of the continuous current," etc., etc., and, continuing, "If aphasia be associated, the anode may be applied to the third left frontal convolution. I prefer the static breeze over the head, with indirect sparks to the affected side." Absurd advice, for no amount of electrization will ever remove a hemorrhage anywhere, much less in the brain. Again, discussing the treatment of epilepsy, the author advises the administration of the static current in the form of wave and breeze over the head, and states that in his experience it has done some good; and he also states that the various forms of insanity are, at times, favorably influenced by using the same treatments as are referred to in the preceding paragraphs. This, of course, cannot be. Insanity cannot be benefited by any form of current, whether applied to the head or anywhere else.

The chapter upon the principles and uses of high-frequency currents is very good, but here also there is repeated quoting of the opinions of others.

The second part of the book is concerned with Röntgen-rays, and is distinctly the best part of the work. The author's well known and long experience with the Röntgen-rays makes his statements authoritative, and this part of the book is excellent. He begins

with an historical introduction, and then gives a comparative study of the properties of the cathode and the Röntgen-rays. He details the various forms of Röntgen-ray apparatus used, the manipulation of the instruments, the fluoroscope and accessories, and gives good advice as to the selection and installation of the *x*-ray apparatus. He then, in great detail, gives the principles of technique of fluoroscopy, skiagraphy, photography, the interpretation of *x*-ray negatives, and of stereofluoroscopy and skiagraphy.

In the next chapter he discusses the clinical application of the Röntgen-rays, taking up in detail fractures, dislocations, and diseases of the osseous system, tumors of the soft tissue, the articulation system, and foreign bodies and their localization. He then discusses the application of the *x*-rays in diseases of the thoracic and abdominal organs, and then of the various specialties, and in dentistry.

The last part of the book is concerned with radiotherapy, radium, and phototherapy, and lastly in the appendix is given a study of the technique employed and the remarks made by many leading exponents of Röntgen-therapy in this country and in Europe.

The book, on the whole, is good, and is a distinct and valuable contribution to the literature on electrotherapeutics and Röntgen-rays. T. H. W.

INTERNATIONAL CLINICS. A QUARTERLY OF ILLUSTRATED CLINICAL LECTURES AND ORIGINAL ARTICLES. Edited by W. T. LONGCOPE, M.D. Seventeenth Series. Vol. I, pp. 318; Vol. II, pp. 312; Vol. III, pp. 296; Vol. IV, pp. 308. Philadelphia and London: J. B. Lippincott Co., 1907.

International Clinics continues to merit the favor of the profession. Each of the four volumes of the seventeenth series has contained a number of very valuable articles of wide diversity in interest —treatment, medicine, surgery, neurology, pediatrics, obstetrics, gynecology, orthopedics, pathology, dermatology, ophthalmology, otology, rhinology, laryngology, hygiene, etc. If most of the articles appeal especially to the general practitioner, this is distinctly in favor of the publication, since it is the general practitioner that the editor has particularly in mind when arranging the contents; but in addition, the general progress of medicine, in its scientific as well as practical aspects, is obvious in the volumes, especially in that which contains a review of progress during the preceding year. The articles are too numerous even for mere mention; without suggesting that the others are of less merit, perhaps attention may be drawn to the following as of especial interest and importance: The Psychic Treatment of Some Functional Neuroses, by

L. F. Barker; The Clinical Diagnosis of Enlargement of the Thymus, by A. S. Warthin; Opening the Pleural Cavity without Pneumothorax, by Th. Tuffier; The Vaccine Treatment of Infectious Diseases, by R. I. Cole; Perforated Duodenal Ulcer, by H. S. Clogg; Practical and Theoretical Considerations Concerning Dietetics, by D. L. Edsall; Common Cardiac Arrhythmias, by A. B. Hewlett; and the Urgency of the Early Diagnosis of Cancer of the Stomach, by A. McPhedran. A. K.

DISEASES OF THE NOSE. By EARNEST B. WAGGETT, M.A., M.B., B.C., Surgeon to the Throat and Ear Department of the Charing Cross Hospital, London. Pp. 282. London: Henry Frowde, Oxford University Press, 1907.

DISEASES OF THE LARYNX. By HAROLD BARWELL, M.B., F.R.C.S., Surgeon for Diseases of the Throat, St. George's Hospital, London. Pp. 266. London: Henry Frowde, Oxford University Press, 1907.

DISEASES OF THE EAR. By HUNTER TOD, M.A., M.B., F.R.C.S., Surgeon to the London Hospital, London. Pp. 317. London: Henry Frowde, Oxford University Press, 1907.

THESE three books, although published separately, are uniform in aim and in their general treatment of the subjects considered in them, and accordingly may be conveniently grouped for review. They are all written to meet the needs of the student and general practitioner and for that reason references to the literature of the subject are avoided, and theoretic topics are left in the background. Although the books are not large, each one of them covers its subject in as complete a manner as may be demanded by those for whom they are written.

Mr. Barwell's book on *Diseases of the Larynx* commends itself most highly to the reviewer. The author goes right to the heart of his subject in every instance, and his book shows evidence of a large amount of original work on the part of its author, and of a very extensive experience in laryngeal diseases. Almost every page bears the impress of the author's personality, and it is a great pleasure to feel that what we read has been written by one who is so evidently a master of his subject. Mr. Barwell's literary style is particularly concise and lucid. and eminently adapted to the style of work he has written. The illustrations of the various laryngeal conditions are most excellent. Although not very numerous, we have rarely seen them collected with such scientific accuracy and artistic perfection. We regret that we cannot afford as much praise to the other two volumes.

Mr. Waggett states in his preface: "These pages are intended to be read as they were written, rapidly from cover to cover" and we regret to state that there is evidence on every page of haste in the writing, if not of care in the correction of what has been written. A curious tendency which is very manifest on the part of the author is to recommend various kinds of auto-experimentation of a most disagreeable character. Thus he advises the beginning rhinologist to have his nasopharynx palpated by an expert, and subsequently by a novice, in order to ascertain how uncomfortable the procedure may be made. Some pages later he advises us how to ascertain the manner of onset of a cold. The page is worth quoting, although we trust but few will be tempted to perform the experiment. "Choose a moment when your nose feels perfectly well, to commence it. Sit down in an overheated room in your indoor clothes with thin socks upon your feet and no boots; open the window to the raw winter evening's air and arrange for a draught slowly to chill the lower part of your person. You probably at first experience no discomfort at all, but after an interval you will find your nose feeling unduly dry and patent. After an hour or so you will find the nose becoming blocked and a sense of dragging weight is felt about the eyes. A little later your nose will begin to run clear fluid, and if you examine this you will find that it contains microörganisms in small growing clumps." The book contains a good explanation of the physiology of respiration. The pictures, which the author states he drew expressly for this work, are very crude and while the majority may express the author's view to himself, they certainly would not do so to anyone else.

The manual of *Diseases of the Ear* by Hunter Tod is much less original in its scope than either of the other two books. It is very similar in character to many other manuals which have appeared in recent years, intended for the use of the student and practitioner, and presents no special points to which particular attention should be directed. The author has a clear and pleasing style, and he has covered the subject very thoroughly. It may be recommended as a good, safe guide for the beginner in otology.

F. R. P.

A Practical Treatise on Fractures and Dislocations. By Lewis A. Stimson, B.A., M.D., LL.D., Professor of Surgery in Cornell University Medical College, New York. Fifth edition; pp. 847; 352 illustrations, and 52 plates. New York and Philadelphia: Lea Brothers & Co., 1907.

In the new fifth edition of Stimson's *Treatise on Fractures and Dislocations* considerable new matter and many new illustrations

have been added. The new matter relates chiefly to fractures of the upper end of the radius, of the carpal and tarsal bones, and of dislocations of the semilunar cartilages. The text on these subjects is entirely up to date, and all of the recent literature on these heretofore obscure lesions is thoroughly reviewed. The high standard of this work is so well known to the profession that it is unnecessary to add anything in review, except to say that as a guide in the treatment of fractures and dislocations it is invaluable, not only to the general practitioner and student, but also to the specialist.

J. A. K.

ATLAS AND TEXT-BOOK OF HUMAN ANATOMY. By DR. JOHANNES SOBOTTA, Professor of Anatomy in the University of Würzburg, Germany. Edited, with additions, by J. PLAYFAIR MCMURRICH, A.M., Ph.D., Professor of Anatomy in the University of Toronto. Vol. III; pp. 342; 297 illustrations, mostly in colors. Philadelphia and London: W. B. Saunders Co., 1907.

VOLUME III, the concluding volume of Sobotta and McMurrich's *Atlas and Text-book of Human Anatomy*, is fully abreast of the others, both in general excellence and in pictorial display. It treats of the vascular system, the lymphatic system, the nervous system, and the organs of special sense. The peripheral nerves and the bloodvessels have been depicted as the student finds them in the dissecting room—that is, together in the one region, so that the book may be used as a guide to dissecting as well as a topographical atlas. As we have said of the illustrations in Volumes I and II, so may we say of those in Volume III—they are unsurpassed; many of them really are works of art. The text, although somewhat subordinate to the illustrations, as is eminently proper in an atlas, is more than sufficient; it has the worthy feature of not being prolix. Such, indeed, are the merits of the three volumes that student, physician, and surgeon alike may use them to advantage as an atlas and as a text-book.

A. K.

TROPICAL DISEASES. By SIR PATRICK MANSON, K.C.M.G., M.D. LL.D. (Aber.). Fourth edition; pp. 876; 241 text illustrations and 7 plates. New York: William Wood & Co., 1907.

THIS well-known and justly prized manual comes to us in its fourth edition much revised, improved, and somewhat increased in size. The first edition was issued in 1898, since which time there has

been unusual activity in the study of diseases of warm climates. Much has been accomplished, of which the most important, as pointed out by the author, consists of the definite installation of the mosquito as a leading factor in tropical pathology; the establishment of the mosquito-malaria theory; the discovery of the relationship of this insect to yellow fever; the discovery of the precise way in which Filaria bancrofti is inoculated by the mosquito; the discovery of a trypanosome in man, and its relation to sleeping-sickness; the discovery of an unsuspected route by which Ankylostomum duodenale gets access to the human intestine; the discovery of the nature and germ of kala-azar and tropical sore; the discovery of a new form of relapsing fever and of its transmitting agent; the definite establishment of the rat flea as the communicator of plague; etc.—all of which and much more is well set forth in the book. This manual, by a pioneer, continues to be, as it has been, the best on the subject in the English language, and it is earnestly commended to the attention of all physicians interested in a field of medicine that has yielded up much in the past and from which much more may be expected in the future. A. K.

GREEN'S ENCYCLOPEDIA AND DICTIONARY OF MEDICINE AND SURGERY. Edited by J. M. BALLANTYNE, M.D. Vol. III: EARTH BURIAL TO GUMMI INDICUM. Pp. 535. Vol. IV: GUM RESINS TO INTUSSUSCEPTION. Pp. 560. Vol. V: INULIN TO LUMBAR PUNCTURE. Pp. 536. Edinburgh and London: William Green & Sons, 1907.

WE have already given a favorable notice of Volumes I and II of Green's Encyclopedia. Volumes III, IV, and V contain, in addition to dictionarial matter, many articles of much value, especially the following: Eclampsia, ectopic gestation, eczema, embryology, epidemiology, diseases of the eye, feces, food, fractures, gastro-intestinal disorders of infancy, female organs of generation, gout, diseases of the heart, hernia, hysteria, infant feeding, infection, inflammation, insanity, diseases of the intestines, jaundice, diseases of the joints, diseases of the kidneys, labor, diseases of the larynx, leukocytosis, and diseases of the liver. But they contain much more—Volume III, 1097 subject headings; Volume IV, 872; and Volume V, 908. Dr. Ballantyne and his collaborators have done their work well, and the encyclopedia may be recommended as an exceedingly useful work, especially for purposes of reference. A. K.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE

UNDER THE CHARGE OF

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The Ophthalmic Reaction in the Diagnosis of Typhoid Fever.—A. CHANTEMESSE (*Gaz. méd. de Paris*, 1907, x, 2). The recent announcement of the use in diagnosis of the skin reaction in tuberculosis and the recent reviews of the ophthalmic reaction to tuberculin and its influence on diagnosis, led Chantemesse to work along the same lines in typhoid fever. As a result, he concludes that the ophthalmic reaction thus obtained is a very reliable and early sign. He obtained his typhotoxin by treating cultures of Bacillus typhosus with absolute alcohol. This precipitate is afterward powdered and used in a watery solution, the dose being about $\frac{1}{50}$ mg. This solution, a drop of which is put in the eye, gives quite a marked reaction, as does a tuberculin instillation. In patients with typhoid fever or convalescent from it, there is congestion, lacrymation, and a serofibrinous exudate. The maximum reaction is attained in from six to twelve hours after the instillation; it may be noticed for twenty-four hours or even a little longer at times, even to three days. In healthy persons and in those suffering from other diseases there is usually slight congestion and lacyrmation, but this always disappears in from four to six hours, and in twenty-four hours the eye instilled is as clear as the normal eye. Just how early this reaction can be obtained is not known, but Chantemesse has shown that in rabbits the reaction may be obtained forty-eight hours after the subcutaneous injection of typhoid cultures. The healthy rabbit showed no reaction; this was also true of the healthy human subject. This reaction, then, is a very valuable sign, and if proof of its reliability is forthcoming it should recommend itself on account of its simplicity when compared to the Widal reaction (which is often so late in its appearance) and to blood cultures.

Experimental and Clinical Investigation of the Pulse and Blood-pressure Changes in Aortic Insufficiency.—HUGH A. STEWART (*Archives of Internal Medicine,* 1908, i, 102). The frequency with which the sphygmograph produces a seemingly normal tracing in cases of perfectly definite aortic insufficiency, when the sensation to the fingers is that of a collapsing pulse, and the fact that this is often blamed on the instrument or on the simultaneous occurrence of an aortic stenosis, led Stewart to an exhaustive study, both experimentally and clinically, of the pulse and blood pressure changes in aortic insufficiency. His conclusions are that the work of Henderson is confirmed in that the cardiac cycle in not diphasic, but triphasic, and consists of systole, the period of ventricular discharge, diastole, the period of ventricular relaxation and filling, and diastasis, the period of rest. The effect of the production of aortic insufficiency on the dog is to increase the amount of aortic systolic output by only a fraction of a cubic centimetre of blood. The volume of the blood which regurgitates is negligible. The transmission of pressure to the ventricle increases the ventricular tonus. It also produces a reflex inhibition of the vasomotor centre. The fall in pressure in aortic insufficiency is due to the diminished peripheral resistance, and is not caused by a loss of blood from regurgitation. The increase of pulse pressure, the difference between maximum and minimum pressure, is due to the lowering of the diastolic pressure. There is no increase in the systolic pressure. The main fall in pressure during systole is due to an increased blood flow through the capillaries. So long as the tonus of the ventricle is maintained, the slowing of the heart rate does not favor increased regurgitation.

Trichomonas Hominis Intestinalis.—HUGO A. FREUND (*Archives of Internal Medicine,* 1908, i, 28). The importance of the various flagellate organisms which at times inhabit the intestines in relation to diarrhœal disorders is quite often overlooked, and may frequently be at the bottom of some obscure enteric disturbance. In the last few years considerable literature has appeared on this subject, mostly from foreign sources. Freund has carefully reviewed this, and also discusses the biology and pathogenicity of this organism in 10 cases which came under his notice. These had a variety of complaints, some, however, relating solely to intestinal disturbance; others presenting the picture of some organic change. The organism does not seem to be pathogenic at all times, yet the fact that it thrives best in an alkaline medium, and that the normal gastric juice is destructive to the parasite as well as its cysts, may account for this occasional lack of pathogenicity. The reported cases, however, seem to indicate the existence of a definite flagellate diarrhœa, especially in children. The symptoms at the onset in acute cases are usually abdominal pain, colicky in character, reaching from side to side and more or less constant. At its height nothing relieves it except opiates. The stools are usually very frequent, unformed, and of fluid consistency. In these latter stools the flagellates are most common. The probable manner of infection is through the food and drink, whereby the spores are ingested. The organisms are most common in the lower small intestine and upper colon, and the latter place is the most common site

of the ulcers and round-cell infiltration. As regards treatment, calomel is most efficacious, especially in small, daily repeated doses of tenths of a grain, following which the diarrhœa diminishes, the pain ceases, and the patient rapidly recovers. Many other drugs have been tried at different times with varying success. Freund concludes that the trichomonad is the direct cause of certain forms of acute, chronic, and recurring enteritis characterized by abdominal pain, diarrhœa, loss of weight and strength, with slight temperature at times and anemia. Whatever may be the immediate result of its injection into the intestinal tract, it is true that the disappearance of, or a great reduction in, the number of organisms results usually in a marked lessening of the symptoms and complete recovery.

Experimental Study of the Action of Oil in Gastric Acidity and Motility.—D. M. Cowie and J. F. Munson (*Archives of Internal Medicine*, 1908, i, 61). The fact that for many years the knowledge concerning the action of the various drugs and remedies administered in the treatment of stomach disorders has been deduced from the results of purely empirical procedures, and that, although some of these methods have been fairly accurate, yet others are subject to more or less criticism, led Cowie and Munson to experiment along these lines, especially in regard to olive oil and its effects on the stomach. (This has been used by them for some years as a routine treatment for hyperchlorhydria, and with very favorable results.) It was an ancient idea that fats retard digestion, but modern experimentation and research have shown the real influence of fats upon the acidity of the gastric juice. The authors, after a long series of experiments, conclude that oil depresses the secretion of the stomach by reflex central action. This action is unlike that of ordinary food stimulation in that it is slower; the reflex central action is a quantitative one, the depression becoming greater as the amount of oil administered is increased. Oil depresses the secretion of the gastric glands by mechanical inhibition of food stimulation, by coating the food and by coating the stomach wall, and in proportion to the rapidity with which the walls of the stomach are covered with oil, the inhibition of secretion occurs from nervous as well as mechanical influences. Olive oil and cotton seed oil, when given in connection with the usual test breakfast, decrease the gastric acidity at the end of the hour and retard the evacuation of the stomach. The beginning of the secretion of hydrochloric acid is delayed when oil precedes the meal; unchanged when it follows the meal. The height of digestion is delayed when oil is given either before or after a meal, and the height of secretion is lowered when oil precedes the meal, but unchanged when oil follows the meal. If the progress of digestion is changed by the removal of small samples of stomach fluid at frequent intervals, it will be observed, when oil precedes the meal by half an hour, that at the end of what is usually taken as the digestive period for a test breakfast (three-quarters to one hour), the acidity is distinctly lowered; while as great a height as is present in the control meal is frequently reached some minutes later. The action of oil on the stomach functions is only a temporary one, which has no effect on subsequent meals unaccompanied by oil. The therapeutic value of oil is apparent in suitable

cases; it is preferable to antacids because of its caloric value. In hyperchlorhydria it should precede the meal; in hypochlorhydria it should follow the meal. In stasis and persistent slow evacuation it should be eschewed; in hypermotility it may be given before, during, or after a meal.

Hemolytic Jaundice.—M. A. CHAUFFARD (*Sem. méd.*, 1908, xxviii, 49) states that the question of hepatogenous or hematogenous jaundice, whether the jaundice is due to biliary retention or to hemolysis, may at times be of great importance, especially when surgical interference may be necessary In a brief survey of the literature on this subject, he notes that extreme fragility of the red corpuscles has been often demonstrated in jaundice experimentally, even though the serum and plasma are apparently normal. In order to detect this condition easily the blood was examined in smears to see if there was any marked difference in the corpuscles, the specimens being dried and stained by the method of Pappenheim, without fixation. In this condition it was found that, together with the normal red blood corpuscles, there were a great many showing granular degeneration; some cells had lost their hemoglobin and were unusually large, but the majority of the corpuscles were smaller—3 to 6 μ in diameter. These are usually present, in very small numbers, in normal blood, but in cases of hemolytic jaundice they may represent 15 to 18 per cent. This, Chauffard says, is not so in an ordinary jaundice due to retention of bile, in which case the red blood corpuscles are not smaller or more fragile, nor do they show any granulations. By experimental work on animals (rabbits), Chauffard has produced, by the introduction of eel's blood serum, a condition similar to that in hemolytic jaundice; on examination he finds that these active changes in the red blood corpuscles go on in the red bone marrow. He reports several personal cases, and others from the literature, showing this condition in the blood, and notes its importance in certain cases in which surgical interference on account of its dangers should be avoided. The demonstration of the condition of blood smears is very easy, and is of great use in differential diagnosis of the cause of the jaundice in certain conditions; it may also have more or less direct bearing on prognosis.

The Acetone Bodies.—T. STUART HART (*Archives Int. Med.*, 1908, i, 219). During the last few years a great deal of work has been done on the acetone bodies, acetic acid, diacetic acid, and oxybuytric acid. If the acetone bodies are excreted in any considerable quantity, it is a positive evidence of improper metabolism. Aside from a knowledge of the sugar output, which is most important in diabetes, the presence first of diacetic acid and later of oxybuytric acid, is also of grave significance, indicating that metabolism is deranged and a condition of acid intoxication imminent. The quantitative determination of these bodies is often most important. In general practice the methods are rather complicated and lengthy. Hence Hart, seeing the need of simpler clinical methods, has devised a procedure based on the delicacy of the well-known test-tube reactions in urine containing the acetone bodies. The practical application of this method is as follows: The urine under examination

is tested for Gerhardt's reaction. If this is positive, we know that diacetic acid and acetone are present in an amount, in terms of acetone, in excess of 0.200 gram per liter. If the reaction is very strong, we dilute the test solution with distilled water until the color approximates that of the standard ferric chloride solution, and this dilution, when compared in one of the author's tables, gives the amount in grams per liter. If the final dilution indicates an acetone content of 0.5 gram per liter or over, we may be reasonably sure that oxybuytric acid is present, and proceed to its determination by means of the polariscope. If Gerhardt's test is negative, we apply successively Arnold's, Legal's, and Lieben's tests in the order named. A positive Arnold reaction indicates something over 0.100 gram per liter of acetone. A positive Legal reaction indicates 0.030 gram of acetone per liter. Lieben's test, if positive, while Legal's is negative, indicates the presence of acetone in an amount within the normal limits. Hart reports 600 examinations of urine with the above methods, the tests for which he gives in detail, and in the various tables notes the results when compared with the more exact quantitative methods which he made in one hundred specimens by means of the Huppert-Messinger method.

Ochronosis.—Edgar Reid, Wm. Osler, and A. E. Garrod (*Quart. Jour. Med.*, 1908, i, 199) report a case of ochronosis in a woman, aged sixty-seven years, who complained of a large ulcer of each leg. She showed patches of dark pigmentation in the eyes and ears, and had been passing urine of a black color. The leg ulcers had been present for about thirty years, never healing. They were dressed by the patient with carbolic oil, 1 to 20, twice daily applied to the raw surfaces, this giving the greatest relief of any dressing. Six years previously she had first noticed that her ears and the whites of her eyes were turning black, and for about eighteen months previous to admission had noticed that her urine was occasionally black when first passed, and if not, turned so some hours afterward. On examination the skin of the face, neck, and hands was sallow; the eyes each showed two patches of bluish black pigmentation near the centre of the sclera. Both ears showed a large area of pigmentation involving the concavity of the anthelix and leaving the rest of the ear free. The hands showed this pigmentation along the extensor tendons about the metacarpophalangeal joints. There was no pigmentation elsewhere to be seen. The urine, which previous to admission had been very dark and showed a reducing substance, was, during the time in the hospital, of fairly normal color, even though the carbolic oil was used again in the dressings. After five months' treatment the pigmentation was much less marked than before and the ulcer was healing gradually. The fact that some of the reported cases of ochronosis give a history of many years association with carbolic acid makes it very probable that this pigmentation can be produced by the absorption of phenol in small and long-continued doses, especially as in this case the improvement was noticed when the applications were reduced and the surface of the ulcer was diminishing. Another point of interest in this case is the fact that only those portions of the body exposed to light showed pigmentation. From the study of the urinary condition in this and other cases, the nature and origin

of the urinary pigmentation may, in some cases of ochronosis, remain obscure. There is, however, good reason to believe that in one group of cases the ochronosis is due to the metabolic error which is known as alkaptonuria, and in another to carboluria, as in this reported case. The clinical features group themselves under three headings—the pigmentation, the color of the urine, and the associated arthritis. The pigmentation is usually evident clinically in the sclerotics and the thinner external cartilages and tendons; only occasionally in the skin. The urinary condition, especially with the alkaptonuria group, has not infrequently led to the diagnosis of diabetes, but this mistake, with our added knowledge of the subject, ought not to occur. In the group with carboluria there is less chance for a mistake. In some of the reported cases there has been a chronic arthritis and more or less irregular joint troubles, in one leading to a very peculiar sort of waddling gait in walking. The plate accompanying this article and that of F. M. Pope, in the *Lancet*, 1906, i, 24, illustrates very beautifully the peculiar appearance and distribution of the pigmentation.

Certain Reflexes in Scarlet Fever.—C. ROLLESTON (*Quart. Jour. Med.*, 1908, i, 117), in view of the fact that lately the various reflexes in diseases other than those of the nervous system have been more or less studied, was led to make some observations in scarlet fever, which has been little studied in this respect. He bases his study on 175 cases of greater or less severity, and concludes that in many cases of scarlet fever the normal plantar response of flexion is temporarily replaced by extension. The more severe the case and the younger the patient the more likely is this change to occur, and, generally speaking, the severer the case, the longer the duration of the phenomena. In a few cases all plantar response was abolished. In a large number of cases, whatever the type of response first obtained, there was an interval of varying duration in which the plantar reflexes were absent. In some cases there was complete absence of the reflex, the muscles of the hip normally concerned in this response being as inactive as those of the foot. In others the hip reaction was brisk, while the muscles of the foot failed to respond. The epigastric and abdominal reflexes are also affected, and, as in the case of the plantar response, so here, the more severe the attack the greater is the liability of their being affected and the longer the duration of any such affection. The epigastric and abdominal reflexes are less frequently affected than the plantar. Usually, the epigastric and abdominal reflexes are contemporaneously affected. If there is a difference, the epigastric is more likely to show diminished activity or abolition than the supra- or infra-umbilical response. The cremasteric response is the briskest reflex of early youth, and is the least likely of all reflexes to be abolished. The knee-jerks were found to be absent in only three cases. All of these three belonged to the class regarded as "severe." Subjects affected with endocarditis showed more derangement of their reflexes than those afflicted with other complications of scarlet fever.

SURGERY.

UNDER THE CHARGE OF

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A Clinical Study of Appendicitis and Gastric Ulcer.—MAHNERT (*Mitt. a. d. Grenzg. d. Med. u. Chir.*, 1907, xviii, 468) says that if we study many cases of acute appendicitis originating, apparently suddenly and violently, with startling and sudden perforative peritonitis, we will find that in most cases, for weeks or months before, there have been repeated attacks of gastric disturbances with alternating diarrhœa, constipation, colicky pains, etc. A careful examination during this period would have shown the evidence of a diseased appendix, and an operation then would have saved the patient's life. Acute and chronic appendicitis can lead first to thrombosis of the veins of the appendix and its mesentery, and then of the omental veins. Emboli may break off from these thrombi and be conveyed to the stomach and duodenum, and there can lead to the development of erosions and small ulcers, and finally to the severe clinical picture of a chronic gastric ulcer. Mahnert asserts that his studies lead him to the conclusion that gastric ulcer occurs with startling frequency in cases of appendicitis. In 36 cases of gastric ulcer, 23 had chronic appendicitis, or 64 per cent. Acute appendicitis cases were not followed by gastric ulcer so frequently, because immediately on coming into the hospital they were committed to the surgical department. Appendectomy should, therefore, not be limited to acute cases of appendicitis, but should be done for the chronic also. Mahnert believes that both forms should be operated on as soon as they are recognized. In a large number of the chronic cases operation can be done under local anesthesia. In many cases, especially in those in which there have been preceding stomach symptoms, the stomach and the surrounding parts should be carefully examined.

Histological Studies on Bone Transplantation in Men.—AXHAUSEN (*Deut. Zeit. f. Chir.*, 1907) says that freshly removed and transplanted bone tissue will die entirely, except its periosteum, which will live and be capable of production. This probably is true also of the bone-marrow. The implanted piece of dead bone will gradually be replaced by newly formed bone. As to the source of this replacement, the most important factor is the transplanted periosteum. Of secondary importance is the part played by the medulla. Then comes, but only by transplantation into an ossifying bed, the bone formation of the walls of this ossifying bed. When decalcified bone is transplanted, only the third

form of bone production occurs, and this only when the transplantation is made into a cavity having an ossifying surface, not when a large piece is transplanted into a defect of continuity in one of the long, hollow bones. For implantation in the latter cases freshly removed bone covered by periosteum is far superior to decalcified bone, and should always be employed. Further investigation must teach us how nearly we may obtain similar results from bone taken, under careful asepsis, from young cadavers.

Strangulation of the Small Intestine through a Rent in the Mesentery.—BELL (*Brit. Med. Jour.*, 1907, ii, 1710) reports a case of a boy, aged fourteen years, who was violently thrown from a bicycle, with resulting concussion and bleeding from the nose, but no other external signs of injury. The next morning there were present the signs of beginning peritonitis. On opening the abdomen, a coil of small intestine was found tightly strangulated through a rent in the mesentery. On removing the dressing on the second day, a bruise exactly the shape of a bicycle handle bar was clearly defined, and made it evident that the cause of the injury was the violent pressure of the handle bar at the time of the accident.

Pericolitis Sinistra, with Abscess Formation and Recovery.—DONALDSON (*Brit. Med. Jour.*, 1907, ii, 1705) reports a case in which the patient was supposed to be suffering from malaria, and was at once put on a course of quinine. The condition improved for a day or two and then got worse again. Symptoms of severe peritonitis developed. Not improving under conservative treatment, an operation was contemplated. Then a slight movement of the bowels was obtained by enemas, and the expectant treatment was continued with the view of determining, if possible, the site of obstruction. Temporary general amelioration followed, although the abdominal distention continued. On about the ninth day from the beginning of the symptoms of obstruction an operation was performed. Three or four days previous to this, examination of the abdomen disclosed a small area of distinctly greater tenderness in the left iliac region, which was dull on percussion. This in the next three or four days became larger until it formed a somewhat oval patch measuring about three inches in its long diameter. Synchronously with this all the symptoms of acute obstruction returned. An incision was made in the long axis of the dull area, and by carefully working deeper an abscess was evacuated, such as one finds in purulent appendicitis. For fear of breaking down the localizing adhesions and infecting the general peritoneal cavity, it was deemed inadvisable to explore farther. Irrigation and drainage were employed. Later septic pericarditis complicated the case, but gradually the symptoms subsided and the wound healed. The conclusion finally reached was that this was a case of pericolitis, probably of the sigmoid flexure, ending in abscess formation.

The Hot-air Treatment after Abdominal Operations.—GELINSKY (*Zent. f. Chir.*, 1908, xxxv, 1) says that in Bier's hot air treatment we have an excellent means of exciting peristaltic movement, and of absorbing

and preventing adhesions. He has employed it for a year with good results. From the day of the operation, the patient is exposed in the hot air apparatus daily, once or twice, rarely more frequently, to a dry heat of 120 to 150 degrees for twenty minutes. It is followed always by an abundant escape of flatus, and the patient feels much better. In 13 aseptic laparotomies, by a single employment of the hot air apparatus, peristaltic movement was started and none of the usual disturbances was observed. In 11 cases of infectious peritonitis following perforative gangrenous appendicitis, there were no cases of postoperative ileus. Ten recovered, and in only 2 did chronic adhesive peritonitis develop. After three and six weeks, respectively, by means of the hot air treatment, the patients completely recovered. One man, with free peritonitis and a bad, irregular pulse, died forty-eight hours after the operation. Even in this case the hot air treatment was followed by an abundant escape of flatus. The absorbing effect was prompt in 4 cases of adhesive peritonitis with the formation of exudate. In a man suffering from a double-sided tuberculous pleurisy and marked ascites, after evacuation of the latter by incision and hot air treatment for two months, he had so far recovered that the fever and effusion had disappeared and he was able to do considerable indoor work. The improvement has continued up to the present time, that is, five months.

Should Cholecystitis and Cholelithiasis be Considered Medical Affections, and what are the Usual Consequences of Treating them Medically?—NANCREDE (*Ann. of Surg.*, 1908, xlvii, 222) says that cholecystitis is an infective process which precedes the formation of calculi, and that with or without stone formation this disease of the gall-bladder implies certain dangers. While the most common form is produced by germs of low virulence, secondary infection with virulent organisms may take place, causing cholangitis—often a most fatal condition—or suppuration or gangrene of the gall-bladder with fatal peritonitis. Crippling adhesions of the stomach and intestines may produce persistent ill health, or even hopeless gastric dilatation. The absence of gallstones at an operation does not prove that none have been passed or preclude the probability of their new formation. Suppurative or gangrenous cholangitis may develop at any time from a chronic cholangitis. Early hepatic drainage will often prevent a lifetime of invalidism or avert death. Although serious capillary hemorrhage usually results from pronounced cholemia, an undetected and mild grade of cholemia preceding a comparatively short and slight jaundice may provide the necessary conditions. Nancrede says that in many of his cases chills, fever, and sweats were merely evidences of an infective process so located that its products could be readily absorbed. He is convinced that during an attack of biliary colic it is vastly more likely that a stone does not pass than that one does. The colic is frequently due to other obstructive causes. Chronic inflammation of the gall-bladder precedes and predisposes to the formation or reformation of gallstones, with all their dangers.

The Value of the Differential Leukocyte Count in Acute Appendicitis.—NOEHREN (*Ann. of Surg.*, 1908, xlvii, 239) states that blood examina-

tion in cases of acute appendicitis is of great value in determining the severity of the condition, and therefore deciding whether immediate operative interference is indicated. The degree of leukocytosis, formerly considered an important diagnostic aid, is too variable to be of any practical value. The relative disproportion between the percentage of polyneuclears and the degree of leukocytosis is reliable in the majority of cases, but the number of exceptions is so great that its practical value in determining immediate operation becomes very small. The estimation of the percentage of polynuclears alone is more reliable than either of the preceding methods, and therefore, together with the fact that it is one of the most easily made, the method to be recommended. A polynuclear percentage of 90 per cent. or more indicates a severe process that needs immediate operative interference; a percentage below 78 per cent. means a "safe" or mild process; a percentage between the two extremes speaks for the one condition or the other, according as it approaches the one extreme or the other.

The Treatment of Juxta-balanic Penile Hypospadias.—SOUBEYRAN (*Arch. gén. de chir.*, 1907, i, 497) says that the Beck-Bardenheuer-von Hacker operation for balanic hypospadias consists in dissecting free the anterior end of the urethra, making a suitable tunnel through the glans, passing the end of the freed urethra through this perforation and suturing it to the glans in the position of the normal meatus. This has given excellent results in the hands of a number of operators. It is applicable, however, only to cases in which the deficiency is only about a centimeter long. Soubeyran has successfully applied the operation, slightly modified, to a case in which the abnormal meatus was more posterior. A narrow collarette of skin around the open end of the urethra was dissected free with the urethra, which was freed for about 3 or 4 cm. The spongy body surrounding the urethra was included with it in order to preserve the vitality of the latter. A perforation was then made with a straight narrow bistoury through the body of the penis from the wound to the glans. This perforation was made in the form of a crucial incision, so as to avoid constriction of the urethra in the glans and especially at the meatus. The urethra was then drawn by the aid of a fine forceps through the new canal. Four sutures were then employed to fix the cutaneous collarette to the margins of the new balanic orifice. The wound in the body of the penis was then closed by sutures.

Ligation of the Common Carotid.—FOURMESTREUX (*Arch. gén. de chir.*, 1907, i, 515) says that death from ligation of the common carotid artery usually results from cerebral complications. These may develop immediately or may come on slowly, the latter being much the more common. Among these the hemiplegia never appeared suddenly, as from an embolus. In all the cases observed by Fourmestreux that were followed by autopsy, there was found an ascending thrombosis, beginning at the point of ligation and extending more or less into the region of the cerebral arteries. He found that only septic ligatures give constant origin to an obliterating thrombus up to the first collateral branch. Aseptic ligatures were followed by healing by first intention of the tunics divided by the ligature. In these cases a thrombus prac-

tically does not exist. The septic origin of cerebral complications will explain the great diminution in their frequency in recent years. The prognosis of ligation of the primitive carotid depends chiefly upon the nature of the affection which requires it. When done for wounds the mortality was 54 per cent.; for exophthalmos, 7 per cent.; the mortality for all cases between 1900 and 1906 was 21 per cent. The cerebral softening and occular lesions are the direct results of the ascending thrombosis. Blood stasis alone, when the arterial walls are sound, does not determine a thrombosis extending to the cerebral arteries. Infection alone, even though slight, is the cause. This is shown by the diminution of their frequency with the development of aseptic technique, the time of their appearance, usually, from the second to the fourth day, their rarity when the operation is simple and rapid, as for exophthalmos or aneurysm, and their frequency when it is prolonged and complicated, as in the removal of a tumor. At autopsy a coincidence was established between ascending thrombosis and suppurative lesions, local or at a distance; and experiments demonstrated that thrombosis developed when infected ligatures were used, and that it was absent when aseptic ligatures were employed.

Lateral Abdominal Herniæ (Pseudoherniæ).—Von Baracz (*Archiv f. klin. Chir.*, 1908, lxxxv, 283) says that lateral abdominal herniæ occupy a special place among the abdominal herniæ. They include those occurring between the costal margin and the ilium, on the one hand, and between the anterior and posterior axillary lines on the other, that is, in the region of the lateral abdominal muscles. They owe their origin either to congenital defects of the oblique muscles or to a partial paralysis of the same muscles from an existing acute anterior poliomyelitis. They are not true herniæ, but pseudoherniæ. They have a broad base, and the hernial rings are not sharply defined on all sides. Usually, the anterior and posterior boundaries are the more sharply marked. Acute anterior poliomyelitis, with resulting paresis and atrophy of a larger or smaller area of the lateral abdominal muscles, is the most frequent, probably the only cause, of the development of the pseudoherniæ. According to the area of the distribution of the primary lesion in the gray substance of the anterior horn of the spinal cord is the area of the paralysis of the abdominal muscles with the associated paralysis of the corresponding lower extremity, or both extremities and the back muscles of the same side. When both lower extremities are paralyzed, usually the one corresponding to the one on which the abdominal muscles are involved is the more paralyzed, or may be totally paralyzed, the opposite extremity being less involved. It is a demonstrated fact that a more diffuse paralysis of the abdominal muscles in the beginning becomes more restricted after the course of several years. The recti muscles are many times involved in the paralysis, but they are stronger than the oblique and offer a stronger resistance to the internal abdominal pressure, and therefore do not take part in the herniæ. Double-sided pseudoherniæ occur, but are rare. More attention should be paid to acute diseases in children, and in every case a careful neurological (electrical) examination should be made. The surgical treatment of these herniæ is almost out of the question. Only

in very small, high, lateral, muscular defects should an attempt be made by plastic operation to overcome it. Proper support by bandage and proper treatment of the associated paralysis are indicated.

Primary Otogenous Thrombosis of the Bulb of the Internal Jugular Vein.—GROSSMAN (*Archiv f. klin. Chir.*, 1908, lxxxv, 63) says that primary thrombosis of the bulb of the jugular vein is only relatively rare. Of from 4 to 6 cases of otogenous pyemia, at least one is the result of this cause. Contrary to the view of Leutert and Grunert, a contact thrombosis is more frequent than one from embolus, which, strictly speaking, produces not a primary but an abruptly progressing thrombosis. Peribulbar abscess is many times the cause, many times the sequel of a bulbar thrombosis. It may by contact with the vein become the cause of a thrombus, or, on the other hand, it may result from a thrombus, caused by an embolus. A primary, parietal thrombus can only be diagnosticated as a probability. To support the diagnosis the sound ear should be examined, for comparison. In this way the detection of a bluish, dark shadow in the lower, posterior quadrant of the tympanic membrane is more readily accomplished. The history also is to be carefully taken, since the discovery of a bulbar thrombosis in a parent or in other children of the family aids in the diagnosis.

In secondary bulbar thrombosis, after the removal of the infectious thrombus from the sigmoid sinus, one often sees healing occur with or without ligation of the internal jugular vein. This occurs generally without disturbing the thrombus in the bulb, or without anything else than irrigation of the bulb from the opened sinus or opened jugular vein. In primary thrombosis, however, and when the fever continues high in case of acute, particularly in a subacute, rarely in a chronic, suppurative middle ear disease, unless, after an exploratory exposure of the sigmoid sinus an extra sinus abscess or a parietal thrombus has been found, with no meningitis or other disease of the body, as typhoid, tuberculosis, etc., one should not delay thorough operation, lest pyemic metastases develop. If one waits until the bulbar thrombosis extends upward to the sigmoid sinus and the products of decomposition break through the wall of the sinus, or until the thrombus extends downward into the jugular vein, cases will be lost which could have been saved through operation on the bulb. Indeed, the simple opening of an extension abscess into the neck has sufficed to bring about the healing of a primary bulbar thrombosis. Yet this, like the healing which has followed the simple ligation of the jugular vein, is a pure accident. In parietal thrombosis of the bulb, one should at least undertake as early as possible the ligation of the jugular vein and the opening of the sigmoid sinus in the region of the inferior knee. The first change of the tampon applied for hemostasis allows the escape of the decomposed products of the bulbar thrombosis and decreases the danger of a thrombosis of the inferior petrosal sinus and of a later fatal cavernous thrombosis. For parietal as well as obstructing thrombosis of the bulb, the treatment is to expose freely and clean out the bulb itself after a preliminary ligation of the jugular vein.

THERAPEUTICS.

UNDER THE CHARGE OF

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Potatoes in Diabetes.—Labbe (*Presse méd.*, 1907, lxxxii, 649) has shown that the starch of potatoes is better borne by diabetics than that of other carbohydrate foods, and especially that it is preferable to that of bread. The potato is better tolerated than milk sugar, and it has distinct advantages over oat flour and the leguminous vegetables. Potatoes contain two and one-half to three times less carbohydrate matter than bread, and they may be employed to the exclusion of the latter. The patient may easily be brought to content himself with one potato, containing from 300 to 600 grains, at each meal. It will usually be found easier to cut out bread entirely from the diet than to diminish its amount, and the substitution of potatoes for it is generally acceptable to the patient. An additional advantage possessed by the potato diet is that it increases the tolerance for and absorption of fatty foods. Labbe does not contend that the potato diet has any specific or curative action, and he holds that in diabetic diet the quality of the carbohydrates taken should be regulated rather than their quantity.

Aspirin in Asthma and Emphysema.—Bader (*Klin. therap. Woch.*, 1907, xiv, 1291) considers that aspirin, in addition to its usefulness in rheumatic and kindred conditions, has a distinct field in bronchial asthma and emphysema, and reports a series of cases to bear out his assertions. In 3 of these the results have been markedly good, and in about 20 others the administration of aspirin has been followed by improvement. In some few instances a tendency to collapse has been noted as occurring as a result of the medication, and to prevent this Bader advises that caffeine sodiobenzoate be combined with the aspirin, which may be given in daily quantity of 60 to 75 grains in divided doses of 7½ to 15 grains each.

The Therapeutic Action of Sodium Cacodylate—Dawes and Jackson (*Albany Medical Annals*, 1908, xxix, 139) report results in 45 patients suffering from different ailments, such as lichen ruber, eczema, psoriasis, simple anemia, splenic anemia, pernicious anemia, Hodgkin's disease, chorea, malaria with gastralgia, and various neuroses. Of these, 34 were either entirely cured or much benefited, 11 were unimproved, and 2 were apparently made worse. Their most striking result was in a patient suffering from lichen ruber with anemia. This

patient received 2¼ grains of sodium cacodylate daily for six days, when the dose was doubled. Six days later the dose was increased to 6¾ grains, and six days later to 9 grains. This dosage was continued for thirty-four days, when it was reduced to 4½ grains. Four weeks later it was reduced to 2¼ grains, and about a month later to ¾ grain every other day for three weeks, when it was omitted for ten days and then resumed for three weeks more every other day. A distinct cure followed. The technique of the treatment is as follows: The sterile solution of the sodium cacodylate is made and each dose is enclosed in a gelatin capsule, which at the time of administration is emptied into a hypodermic syringe, which is then filled with boiling water. The injection is given, while still warm, through a long needle and under thorough asepsis, deeply into the gluteal region. A sense of exhiliartion is often noted as taking place soon after the injection. The treatment is almost always followed by a distinct gain in weight, and the rapidity of improvement seems to depend much upon the size of the dose, being slow with small doses and quick with large ones.

Ipecacuanha in Amœbic Dysentery.—RAYMOND (*Military Surgeon*, 1908, xii, 46) writes enthusiastically concerning the use of ipecacuanha in amœbic dysentery. He gives full details of his treatment, which, in addition to rest in bed, preliminary opening of the bowels by a saline, fluid diet, and general careful nursing, consists in the administration of 30 drops of tincture of opium followed in twenty minutes by 6 gelatin capsules, each containing 5 grains of ipecacuanha. These should be swallowed with as little water as possible, and the patient is enjoined to lie perfectly still, and an ice-bag is applied to the throat. If the advised precautions are carried out, no emesis is likely to ensue. The ipecac is repeated on the following day and the next, and then all medication is stopped except the administration of 15 grains of ipecac, preceded by 20 drops of tincture of opium, each evening for the next four days. The ipecac is diminished then to 5 grains for two or three days, when the amœbæ may be considered to be eliminated from the system and the process of repair inaugurated.

Alcohol in Gastric Diseases.—SALISBURY (*Journal of Inebriety*, 1907, xxix, 289) concludes a consideration of this subject as follows: (1) No harm can come from the exclusion of alcohol from the diet of normal men, nor of those afflicted with gastric disease. (2) The amount of alcohol which may be taken without harm is undetermined, but probably does not exceed 3.75 drams daily. (3) There is no reason why this amount should be decreased on account of a special injurious action on the stomach, but it is possible that the continuous use of small amounts may produce injurious effects. (4) Alcohol increases the acidity but not the pepsin of the gastric juice, favors motility and absorption, and is itself readily absorbed. In moderate amount it causes no significant retardation of digestion, but its continued use in large quantities produces hyperchlorhydria, acid gastritis, mucous catarrh, and final destruction of the gastric glands. (5) Alcoholics are objectionable in stomach disease on account of constituents other than ethyl alcohol, fusel oil, tannin, yeasts, etc. (6) Alcohol is contra-indicated in ulcer,

hyperacidity, and catarrhs in which it has been a causative factor. It is of doubtful propriety in neuroses, on account of the possibility of habit formation. (7) Alcoholics may be used, under restrictions, as a stimulant to the appetite, but their continued employment tends to lessen the response of the gastric mucosa to the normal stimulus of food. (8) The use of alcohol to relieve gastric distress is rational, but it should be employed only temporarily. (9) The use of alcohol to counteract the irregular distribution of blood in consequence of vasomotor disturbances is rational, but requires further investigation.

Potassium Iodide in Mental Diseases.—WALKER (*New York Med. Jour.*, 1908, lxxxvii, 19) reports eleven instances, some of them syphilitic, of mental disease in which potassum iodide in massive doses has exerted a pronounced effect. He considers that it is impossible to give enormous doses of this drug unless the patient is on a full diet and the iodide is given directly after meals. He employs the saturated solution in water or given in milk, and has yet to find an individual who is unable to take the drug in very large doses. In most patients a "primary eruption," situated chiefly on the chest and face, is noted; slight nausea also may occur, both these symptoms, however, disappear upon increase of dosage. In a good percentage of cerebral syphilis, if treatment is begun within three months after mental impairment is noticed, the patient will regain his normal faculties. Some difficulty may occur in getting the dose above 300 or 400 grains, but only when it is impossible to get the patient to eat heartily, and Walker has a number of patients who, after passing out of his hands, have been taking 60 grains of the drug three times daily for months without deleterious effect.

Vaccine Therapy in Bacterial Diseases.—FLOYD and WORTHINGTON (*Boston Med. and Surg. Jour.*, 1908, clviii, 5) conclude a paper on this subject with the following statements: (1) Each new method in medicine should have a thorough trial before it is rejected. (2) A non-attenuated specific vaccine, given in proper dose, is essential to success in vaccine therapeutics. (3) To control the amount and frequency of the dose of a vaccine, either the opsonic index or the general clinical symptoms may be the guide. (4) Localized infections of moderate duration offer the best field for treatment. (5) The vaccine treatment, when used in conjunction with medicine and surgery, may lessen suffering and deformity and frequently save life.

Stock Vaccines versus Autogenous Vaccines in Therapeutics.—BEEBE and MEDALIA (*Boston Med. and Surg. Jour.*, 1908, clviii, 37) state that the question whether a stock or an autogenous vaccine should be used varies with the individual patient. Whenever possible they are accustomed to use an autogenous vaccine. In affections of long duration, however, it has been observed that at times an autogenous vaccine no longer produces good results, for the reason that the patient has become tolerant to it. This tolerance may be due to the fact that the dose is too small, or that there are too frequent injections in one spot, or that the vaccine has too little virulence. When cultures show a growth of Staphylococcus pyogenes albus, or a weak Staphylococcus

pyogenes aureus, a stock vaccine made from five or six virulent strains of Staphylococcus pyogenes aureus often gives better results. In more acute and virulent infections, other than staphylococcic, autogenous vaccines have proved very satisfactory.

The High-frequency Current in Hemorrhoids.—IMBERT (*Marseilles médical*, xliv, 581) has found the high-frequency current useful in hemorrhoids accompanied by bleeding. This treatment is especially indicated in aged patients in whom an operation might be followed by untoward consequences. After the first application the hemorrhage ceases and does not reappear, the current appearing to cause a distinct diminution of the congestion and to exert a remarkable analgesic effect, the pain ceasing under its influence and the contraction of the sphincter being relieved.

Urotropin and Albuminuria.—LANGHELD (*The Therapist*, 1907, xvii, 133) concludes a study of the effect of urotropin in producing albuminuria with the following statements: Urotropin, even in large doses, does not cause an excretion of albumin in healthy individuals; on the other hand, small doses are followed by albuminuria if hereditary taint, such as degeneracy, or acquired weakness exists. The cause is always some neurotic degeneration in the sympathetic nerves and may be threefold, either (*a*) the existing regulating factors perform their function at intervals, but fail to do so in case of any increased irritation, or (*b*) the neurotic function has at some previous time been affected and regenerated only so far that even a very slight new insult is sufficient to cause it to fail, or (*c*) an interruption in the function does not exist as far as demonstration goes nor has any insult occurred in the region of the renal function; there exists, however, a general disturbance in the nutrition and function of the nerves which needs but a slight additional burden (through urotropin) to make its appearance. It is assumed that within the kidneys there are sympathetic nerve fibers which, under the above-mentioned hypotheses of morbidity would be affected by passing formaldehyde to such an extent that they either contract or harden, and thus allow the albumin to pass or to form.

The Roentgen-rays in Sarcoma.—PFAHLER (*New York Med. Jour.*, 1907, lxxxvi, 1153) states that the Röntgen-ray treatment of sarcoma has in the past been confined to inoperable and rapidly recurring types of this tumor; in other words, it has been practically confined to the treatment of hopeless cases, and therefore the results obtained are marvellous. This form of treatment can be recommended in all inoperable cases, but the more extensive the disease the less likely are we to obtain a complete recovery. In cases suitable for operation the rays should be used before and after operation. In each instance there should be a consultation between the surgeon and the Röntgenologist. The freedom from recurrence is surely greater than that obtained from any other form of treatment in the same class of hopeless types of sarcoma. Some of these patients have remained well for from three to four years after cessation of treatment. Finally much will depend on careful technique and skilful application of the rays.

PEDIATRICS.

UNDER THE CHARGE OF
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The Caloric Value of Modified Milk in its Relation to Infant Feeding.—LADD (*Archives of Pediatrics*, 1908, xxv, 178) carefully fed 20 infants upon accurate modifications of milk, the caloric values of which could be closely estimated. Most of the infants, when first seen, were underdeveloped and subject to varying degrees of gastric and intestinal indigestion. He draws the following conclusions from his investigation: (1) The calories in the food of an infant in the first year of life cannot be furnished by the fats, sugar, and proteids vicariously, if the best results of substitute feeding are to be obtained. (2) The number of calories required increases in each quarter of the year. In this series of 20 cases the average number of calories ingested each day for the four periods was 483, 666, 860, and 1018, while the corresponding energy quotients were 116, 126, 125, 120. (3) A given number of calories per day does not necessarily cause the same rate of growth in infants, even if they are of the same age and development. (4) A food of a given energy quotient does not necessarily cause the same rate of growth in infants, even if they are of the same age and development. (5) The caloric value of the food, expressed either in terms of the number of calories ingested daily or as the energy quotient, is not the most important consideration in determining the quality of an infant's food. The nutrition of an infant depends primarily upon its power to digest and assimilate milk. These functions are best served by modifying the percentages of the constituents of milk so as to adapt the food to the individual needs of the infant. In a gi en case, neither the number of calories nor the energy quotient of the food can be positively determined by rule, but, like the fats, sugar, and proteid in percentage feeding, must be ascertained by experiment. The calculations of calories and energy quotients in connection with percentage feeding can be easily made, but they add nothing in the way of information which cannot be obtained by careful observation of the gastric and intestinal functions and the weekly gain in weight.

Kernig's Sign in Infancy: A Study of 2000 Cases.—Kernig's sign consists in the inability to extend the leg fully on the thigh when the thigh is at right angle with the trunk, or to flex the thigh to a right angle when the leg is extended on the thigh. The sign is not positive unless the angle is 135 degrees or less; it is an involuntary manifestation and not accompanied by pain, as is the case in sciatica, in which the unwillingness is voluntary and due to pain. J. L. MORSE (*Archives of Pediatrics*, 1908, xxv, 167) examined 2000 infants under two years of age, afflicted with a large variety of diseases, to determine the value of the sign in different conditions. Of 507 normal babies, not one of them showed

Kernig's sign. Of 85 pneumonia patients, only 2 had the sign; neither of the two had meningitis. Concerning meningitis, his conclusions are: Kernig's sign is almost never found in infancy, either in health or disease, except in meningitis. It is found so rarely in other diseases at this age, that its presence in an acute case justifies, so far as any one sign can, the diagnosis of meningitis. It is never present in some cases, however, and in many others it is present only intermittently. It occurs with equal frequency in all stages of the disease. It has no apparent connection with the degree of intracranial pressure. It is more often present when the knee-jerk is increased than when it is diminished. It is of no value in the diagnosis between the tuberculous and the cerebrospinal forms.

Acute Hemorrhagic Nephritis following Epidemic Parotitis in a Seven Months' Old Child.—JELSKY, of Danzig (*Archiv f. Kinderh.*, 1908, xlviii, 164), reports the following fatal case of mumps: A boy, aged seven months, shortly after he had recovered from bronchopneumonia, developed an attack of mumps. Three others in the family had previously suffered from the same disease. The process consisted of a marked swelling of the parotid gland on the right side, increased flow of saliva, and slight fever. After nine days the child had sufficiently recovered to be sent to the street on a hot day. Two days later the condition recurred and the skin over the lachrymal region was reddened. The temperature rose to 104°, and the diapers showed a reddish stain, which was found to be due to hemorrhagic urine. The urine contained blood, albumin, and blood casts. The submaxillary gland became affected later, and the child died with uremic symptoms. Bacteriological examinations of the urine and saliva revealed a number of organisms, but none of them proved to be pathogenic in animal experiments. Of the other three children in the same family affected, the first had the lightest attack, the second was more seriously ill, and the third still more so.

Treatment of Prolapse of the Infantile Rectum by Stiffening with Paraffin in Longitudinal Strips.—After discussing the pathology, etiology, and treatment of prolapse of the rectum in children, N. A. KEPHALLINOS (*Jahrb. f. Kinderh.*, 1908, lxvii, 325) describes a method of treatment which has been employed by Spitzy, of Graz, in 32 cases. The prolapse is reduced, the rectum evacuated and thoroughly cleansed, and the neighborhood of the anus carefully disinfected. The armamentarium consists of a syringe with a capacity of 5 c.c., covered with a soft rubber mantle to prevent the rapid cooling off of the paraffin, and a cannula needle 10 cm. long; paraffin with a melting point of 45° to 50° is used and kept ready in a water bath at a temperature of 60° to 65°; also sterilized water at the same temperature. After the child is etherized, the warmed syringe is filled with paraffin, one-eighth of which is then ejected and in its place hot water sucked up; the cannula, which cools off more quickly than the syringe, is thus filled with hot water and kept warm. The left forefinger is inserted into the rectum and the cannula made to perforate the skin 1 cm. to the outer and posterior part of the rectum; it is pushed into the pararectal tissue to

as high a point as is possible parallel with the rectum; the inserted finger acts as a guide to the needle. Care must be taken not to perforate the rectal mucosa. The paraffin is then injected as the syringe is withdrawn. The same procedure is repeated on the opposite side, thus supporting the rectum with two longitudinal rods of paraffin. The injection must be made quickly and with the same amount of force all along the line; when the syringe is within 1 cm. of the anal skin, the injecting must cease, or a paraffin clot will close the skin wound. A plaster dressing is then applied and the child kept in bed two days. Of the 32 cases, 31 were cured, and in no instance was embolism observed.

Bacteriological Examination of a Case of Noma.—After discussing at some length the literature of the bacteriological findings in noma, HELLESEN (*Jahrb. f. Kinderh.*, 1908, lxvii, 294) reports the case of a boy, aged three years, who had passed through measles several months before the present illness, and had recovered perfectly. Two weeks before he came under observation he began to complain of pain in his right ear, but had no discharge. He recovered from this, and nothing abnormal was noted until four days before his admission, when the right cheek became painful and showed some swelling; this increased in spite of local treatment, and became gangrenous within a few days. The gangrene began on the inner side of the cheek, and was associated with œdema and infiltration of the cutaneous surface; the process spread continuously until within a few days before death, which occurred three weeks after the disease commenced. Marked anemia developed in the course of the process. Hellesen made a series of examinations, and succeeded in isolating a diplococcus, which he found constantly in the sections of the diseased tissue; other bacteria were found as well, but none in as large numbers as the diplococcus mentioned. They were also found in the neighboring round-cell infiltration and the surrounding apparently healthy tissue. They were found in the blood of the patient during life and after death, and could be isolated in pure culture. A specific necrosis was produced by them in animal experiments, and the organisms could be recovered from the blood and the necrotic tissue of the animals. The nomatous tissue and the isolated diplococci were experimented with. Hellesen concludes that the diplococcus in question was the cause of the case of noma he studied. He is not willing to draw any conclusions for noma in general, however, from this one case, but states expressly that no Klebs-Loeffler organisms were present.

OBSTETRICS.

UNDER THE CHARGE OF

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Three Cesarean Sections for Unusual Indications.—SEIFFART (*Zent. f. Gyn.*, 1907, Nr. 31) reports the case of a Cesarean section for eclampsia in a primipara at eight months; the cervix was not dilated and

the patient seemed excessively ill. She was placed in a motor car and taken rapidly to a hospital, where Cesarean section was performed. Mother and child made a good recovery. His second case was also one of eclampsia and was treated in a similar manner, with recovery of mother and child. The third case was that of a girl, aged fourteen years, who was suffering from very great œdema of the lower extremities and genital organs. There were no labor pains, and heart sounds could not be heard. This patient was taken in a motor car to the hospital as soon as possible, the child delivered by Cesarean section. The child was born asphyxiated and revived and mother and child made a good recovery.

A Method of Introducing Air into the Mouth of a Child Born in Breech Presentation.—RUHL (*Zent. f. Gyn.*, 1907, Nr. 31) believes that much can be done to save the lives of children born in breech presentation by introducing air into the mouth of a child while the head is on the pelvic floor. In one of his cases he incised the cervix freely with blunt-pointed scissors, and introduced the hand in such a manner as to open the cervix with the fingers, admitting air. He also describes the use of an instrument shaped like the blade of a forceps, for the same purpose.

Scopolamine-Morphine Anesthesia During Labor.—NEWELL (*Surg., Gynec., and Obst.*, August, 1907) gives the results of the use of scopolamine-morphine in 123 cases. A solution containing $\frac{1}{10}$ grain of Merck's scopolamine-hydrobromide and $2\frac{1}{2}$ grains of morphine sulphate was prepared at least every fourth day unless needed more often. When uterine contractions occurred every five minutes the patient was given $\frac{1}{150}$ grain of scopolamine and $\frac{1}{6}$ grain of morphine hypodermically. At the end of one to two hours this dose was repeated unless the patient was promptly influenced by the first dose; when this was the case the second dose was not given until the effects of the first dose began to disappear. The dose was not repeated if the cervix was dilated two-thirds, to avoid the continuous action of the drug after labor. The drug produced a definite result, the majority of patients becoming drowsy or sleeping between the pains. It was found that when a fresh solution was used all the patients reacted to the drug. The suffering of labor was much less, in some cases being entirely removed. Patients did not remember to have endured pain in most cases; labor was shorter as well as easier; the necessity for interference was less. Hemorrhage was not more frequent than in other cases, nor a tendency to bleeding; occasionally relaxation of the uterus developed. Upon the heart, respiration, and pulse no bad effects could be observed. Of the 123 cases 17 had practically no pain during labor; 70 had little discomfort; 19 slept lightly during the pains, but had distinct pain when the uterus contracted; in these cases the patient slept between the contractions, but had definite and severe pain when the contractions occurred. In 11 cases the drug produced no effect. Thus, in 112 out of 123 cases labor was made distinctly less painful and more easy by this method. In 71 primiparæ labor averaged fifteen hours in duration. In 51 primiparæ in whom the dilatation varied from two inches to a finger-tip the child was

born, in 20 cases, within four hours after admission. In 10 other cases dilatation was complete in this time. In 14 patients operation was necessary; 1 had eclampsia; 1 prolapsed cord; 1 high arrest of the breech in a contracted pelvis; in 1 a high application of forceps. The low forceps operation was done ten times. This would seem to indicate that by relieving the pains of the first stage of labor more vigorous contractions developed during the second. The quantity of blood lost after delivery seemed to be less rather than more in these cases and the uterus contracted well. In 90 per cent. the results of the treatment were satisfactory.

Pubiotomy in America.—Fry (*Surg., Gynec., and Obst.*, August, 1907) reports two pubiotomies and gives a summary of the results obtained by American operations to date. His first case was that of a multipara, who had previously been delivered with great difficulty by a high application of axis-traction forceps; in the second labor efforts were again made with forceps, but proved unsuccessful. The external conjugate measured 17.5 cm., the true conjugate 8.5 cm. The urine obtained by catheter was bloody. Cesarean section was declined because of previous efforts at delivery and from the fact that the patient was probably infected. Incision was made a little to the left side of the median line of the pubes, and the Gigli saw was attached to a ligature and drawn through. The bone was severed about 1 cm. to the left of the joint. The child was easily delivered by forceps, the ends of the bones separating about 5 cm. There was moderate hemorrhage easily controlled, and a transverse tear on the left side at the attachment of the anterior vaginal wall. This was closed with catgut, and healed without infection. Hemorrhage occurred from the uterus, which was controlled by hot sterile douche and gauze packing. The patient's recovery was complicated by a temperature of about 102° F. and foul lochia for the first week. The pelvis was encircled by a broad strip of adhesive plaster and an abdominal binder and sand-bags were placed at the sides. The patient was convalescent in about four weeks after the operation. Ten weeks after operation bony union was found to be good without callus. The patient could walk without pain and go up stairs without difficulty. The child weighed ten and a half pounds; the anterior fontanelle was almost closed and the various diameters of the head were large. The child died on the fifth day, and autopsy revealed two fractures of the occipital bone and a blood clot at the base of the brain.

The second case was that of a primipara in whom a high application of forceps failed to deliver. The pelvis was flattened, with true conjugate 8.5 cm. The head was transversely at the pelvic brim. The perineum had been torn and the vulva was badly bruised. The patient was very fat and the surroundings very unfavorable for asepsis. Pubiotomy was readily performed and the child delivered by forceps. The bones separated about 4 cm., with very little hemorrhage. Two chromicized catgut sutures were used to close the periosteum; the pelvis was immobilized as before. In addition a heavy canvas belt was doubled about the pelvis. The patient was annoyed by distention of the abdomen and had fever for the first week, followed by phlebitis of the left leg. She

did well, however, until the tenth day, when she was turned upon her side; this was followed by cardiac embolism and death twelve hours after. The child was practically stillborn and badly bruised by the forceps.

Fry collected from the work of American operators 20 pubiotomies, of which 12 were primary and 8 secondary. The maternal mortality was 20 per cent., none in the primary operation, which makes the mortality 50 per cent. for the secondary. The causes of death were shock the second day; sepsis on the fifth; heart embolism on the eleventh; pulmonary embolism forty-two days after operation. 40 per cent. of the infants died during the first week. Laceration of the anterior vaginal wall occurred in 7 cases; this was repaired and healed without complications. The child was readily delivered in all the cases, the average separation of the bones being about 4 cm. There was postpartum hemorrhage in 2 cases.

All the patients had rise of temperature during the puerperal period, ranging from 99.8° to 102.4° F. Septic phlebitis developed in 5 cases; hematoma and œdema of the vulva in 5 also. In all good bony union occurred, and all patients walked well except 1. There was no callus of the posterior portion of the bone in any of the cases; but 1 on the anterior surface and at both sacro-iliac joints.

When the child is living and Cesarean section is contra-indicated, a moderate degree of pelvic contraction justifies the performance of the operation.

Spontaneous Rupture of the Cervix in Abortion.—BLUMREICH (*Zent. f. Gyn.*, No. 29, 1907) saw a very unusual case of a primigravida, in whom it was necessary to terminate an early pregnancy. Iodoform gauze was introduced into the cervix, followed by the development of considerable pain. The temperature rose also; the pulse increased in frequency; the uterus became very sensitive and there was a fetid mucous discharge. To hasten the emptying of the uterus, tents and bougies were used. This was followed by increase in pain. Twenty-four hours afterward, examination showed that the cervix had not dilated, but had ruptured above the external os. It was necessary to empty the uterus completely under anesthesia and to remove portions of the cervix which had already been torn. The patient recovered, the tears healing by granulation.

GYNECOLOGY.

UNDER THE CHARGE OF

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Internal Hemorrhages after Bilateral Castration.—BACHELLERIE (*Thèse de Bordeaux*, 1907) states that the uterine hemorrhages that follow bilateral castration do not resemble menstruation, either in periodicity,

amount, or duration. If the flow is regular, presumably ovarian tissue has been left behind. In most cases the hemorrhages are due to the lesions of pelvic cellulitis reacting upon some morbid condition of the adnexa and surrounding tissues. The acute exacerbations of such pelvic cellulitis by reflex action cause uterine congestion and a flow of blood contemporaneous with the inflammation. The influence of the menstrual habit is conceded. The approach of the period of former menstruation disposes to uterine congestion and hemorrhage. The class of uterine hemorrhages under consideration demands a careful examination of the pelvic cavity to ascertain the characteristics of the cellulitis in each individual instance.

Primary Epithelioma of the Vagina.—TRAPENARD (*Thèse de Paris*, 1907) declares this disease occurs most frequently between the ages of thirty and fifty years, and that it seems absolutely unmodified by heredity or pregnancy. Nor have congenital anomalies, parasites, or irritations been found to be influential in its development. Trapenard recognizes it may be tubular or cylindrical, and histologically it may be papillary or interstitial. It develops rapidly, and always extends through the lymphatics. It is likely to recur in every case.

The Shape of the Labia Minora during Menstrual Life.—JAYLE (*Rev. de gyn. et de chir. abdom.*, May, June, 1907) has examined 500 women during menstrual life with a view to determining this point, and concludes: (1) The labia minora in most cases project between the labia majora; (2) the preputium clitoridis is not anatomically an offshoot of the labia minora; (3) the labia minora may enclose only the anterior part of the vaginal orifice, or may surround it completely; (4) there may be a paranymphal fold between the labia minora and majora; (5) separate commisural folds may exist at the posterior part of the vaginal orifice; and (6) the fourchette may be formed by the posterior commissure of the labia minora, by a prolongation of the paranymphal folds, or by a separate commissural fold.

Origin of the Hymen, Vagina, and Urethra.—RETTERER (*Rev. de gyn. et de chir. abdom.*, May, June, 1907), after a rather extensive study of the development of the hymen, vagina, and urethra in various mammals, by means of serial sections of the embryos and fœtuses, concludes that the structures are not developed from the Müllerian ducts, but from the urogenital sinus. Retterer states the urogenital sinus is divided by projections from the lateral walls which form the septum between the urethra and vagina. The anterior tube thus formed becomes the lower part of the urethra, and the posterior tube becomes the vagina. The upper part of the urethra is formed from the pedicle of the anterior tube which becomes the lower part of the urethra and the posterior tube. The hymen is developed from two folds of the posterolateral walls of the urogenital sinus, and is vestibular and not vaginal in origin.

A New Flap Operation for Vesicovaginal Fistula.—L. MOSZKOWICZ (*Zent. f. Gynäk.*, 1908, xxxii, 65) makes two flaps, both of which are left attached at the margin of the fistula. The first flap consists

of vaginal mucosa, and is made larger than the opening to be closed. The second flap is about the size of the opening, and is made preferably from the bladder mucosa, but may also be made from the vaginal mucosa. The vaginal flap is turned into the bladder, the epithelium facing the interior of the bladder, while the flap of bladder mucosa is turned in like manner into the vagina. The first flap, being larger than the fistulous opening, naturally overlaps its edges, and with the contents of the bladder pressing against it acts as a valve. The two flaps are sewed together with catgut. Moszkowicz reports one case in which this method was used with satisfactory results.

The Supports of the Pelvic Viscera.—W. E. FOTHERGILL (*Jour. Obst. and Gyn. Brit. Empire*, 1908, xiii, 18) carefully treats this subject and suggests as follows: (1) The so-called ligaments of the uterus lie loosely upon the subjacent structures, and have no supporting action. The broad ligament is simply a mesovarium and mesosalpinx. The utero-sacral and uterovesical folds are incapable of resisting downward pressure, as is the round ligament, which, moreover, is a vestigial structure (gubernaculum ovarii et uteri). (2) The external muscular layer of the pelvic floor has a sphincteric rather than a supporting action. (3) The internal muscular layer of the pelvic floor, being the degenerated representative of the tail muscles of lower animals, has largely lost its muscular action; and the lower part of the levator ani merely acts as an adjuvant to the sphincters of the recum and the sphincter vaginæ. (4) The classical descriptions of the pelvic fascia should be given up, and the fascia should be regarded as the sheaths of the muscles, the vessels, and the viscera. (5) The internal muscular layer, with its fascial investment, forms the funnel-shaped pelvic diaphragm. (6) The pelvic diaphragm does not support the pelvic organs by its muscular action. (7) The pelvic diaphragm could not support the pelvic organs in virtue of its shape, were they not firmly attached to its sloping lateral walls. (8) This attachment is accomplished by the fibrous sheaths of the bloodvessels and accompanying structures which supply the pelvic viscera. The one constant essential cause of prolapse is relaxation of the perivascular sheaths. (9) The rectum has attachments to the back of the pelvis quite distinct from those of the urinogenital organs to its sides. It does not descend with them in prolapsus. When the anterior rectal wall descends in rectocele it is united with the posterior vaginal wall by cicatricial tissue, the result of infection during the healing of perineal tears.

The Treatment of Inoperable Carcinoma of the Uterus with Acetone.—G. GELLHORN (*Münch. med. Woch.*, 1907, liv) has had favorable results in alleviating the distressing symptoms of inoperable carcinoma of the cervix by the local application of acetone. This drug was first used for the purpose of lessening the offensive odor, which it was found capable of destroying almost entirely. It was observed, moreover, that the discharge was materially checked and hemorrhage to a large extent controlled by the acetone treatment. While the method is offered only as a palliative measure capable of relieving the patient either entirely or to a large extent of the most distressing symptoms of the disease, it is considered possible that life may be prolonged in this way.

The treatment is carried out as follows: As much of the growth as possible is removed and 5 to 10 c.c. of acetone is applied directly to the diseased surface through a cylindircal speculum which is held firmly against the growth, the patients pelvis being elevated to facilitate the application. The acetone is allowed to remain in contact with the surface for about thirty minutes, when a strip of gauze is packed into the curetted cavity, thus absorbing the excess of acetone and keeping it in contact with the diseased surface. The pelvis is then lowered and the lower portion of the vagina and the vulva are douched and dried. The gauze is removed in twenty-four hours. The application of acetone is made three times a week or less often, as the case may require.

Tuberculosis of the Neck of the Uterus.—DELETREZ (*Ann. de gyn. et d'obst.*, 1908, xxvi, 34) reports a case of this rare condition operated on by him, and exhibits four illustrations of microscopic slides made from tissues removed. The patient was a girl, aged twenty-one years, who, although menstruating regularly, had since the age of fourteen years suffered from profuse leukorrhœa, but had an appearance of excellent health. The cervix was found to be voluminous, and through a speculum presented the appearance of a mushroom fungus entirely similar to cancer of this structure, with even some excavation. The fungosities were seen to be developing from the cervical canal as well as from the vaginal side of the portio vaginalis. An examination of the patient failed to reveal tuberculosis in any other part of the body. Six months after vaginal hysterectomy the patient was in excellent health. The specimen was carefully examined. The uterus had normal dimensions except a part of the cervix, which was thickened and had attached to it numerous cauliflower-like growths. The internal surface of the body had a fibrous appearance and some small disseminated granulations approaching the neck, involved by numerous papillary granulations disseminated on its surface; the section showed a rose-colored tissue having less firm consistency and without apparent delimitation with the uterine tissue. Microscopic examination of various portions of the cervix and uterine body were made, all of which showed inflammatory and tuberculous infiltration, with accumulation of giant cells and small round cells in nodules. The stratified pavement epithelium was invaded with abundantly infiltrated and necrosed areas, and hemorrhagic areas were noticed. Various areas of tuberculous invasion were demonstrable in the mucosa of the body and cervix, nodules being plentiful. No tubercle bacilli were found, nor was the microscopic appearance at all that of epithelioma. He states that the primary variety of tuberculosis of the cervix occurs in a very small percentage of all cases.

Carcinoma of the Vulva.—R. TELLER (*Zeit. f. Geb. u. Gyn.*, 1907, lxi, 309) reports 36 cases of carcinoma of the vulva, and discusses the data quite fully. In 16 cases there was a recurrence of the disease, which serves to emphasize the need of thoroughly removing all connecting lymphatic glands.

OPHTHALMOLOGY.

EDWARD JACKSON, A.M., M.D.,
OF DENVER, COLORADO,
AND
T. B. SCHNEIDEMAN, A.M., M.D.,
PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC.

Ophthalmoplegic Migraine.—DeLapersonne (*La clin. ophtal.*, 1907, No. 6, p. 90) reports a case of ophthalmoplegic migraine remarkable for its long duration. A woman, aged fifty-four years, was affected since the age of seven years with attacks of migraine lasting from one to four days. At first the eye was closed during the attack; from the age of fourteen the attacks occurred every month accompanied by ptosis and crossed diplopia, which persisted some days after the cessation of the pain. At about the age of forty the external strabismus became permanent, the attacks becoming rarer. Sulzer reports a case in which the attack recurred after thirty-three years. Jacques observes that many cases apparently belonging to the type of ophthalmoplegic migraine are actually symptomatic of an anatomical lesion, so that great reserve is necessary in the beginning in the diagnosis.

Paralysis of the Accommodation in Diabetes.—DeLord and Revel (*La clin. ophtal.*, 1907, No. 13, p. 204) observed in a diabetic subject complete bilateral paralysis of the accommodation. It began suddenly and lasted a month, disappearing as suddenly as it came. There were no disturbances of the pupillary reflexes. They ascribe the paralysis to inhibition of the cerebral centre of accommodation.

Congenital Palsy of the Oculomotor Nerve with Continuous Movements of the Pupil.—Levinsohn (*Zeit. f. Augenh.*, 1907, 341) describes the case of a child, aged six years, in whom, while the left eye was normal, the right eye showed almost total paralysis of the oculomotor nerve, with constant variations in the diameter of the pupil, changing from 2 to 9 mm., remaining at it maximum and minimum from ten to twenty seconds. About ten seconds are required for the mydriasis to take place, and but one to five for the transition to myosis. These movements are not influenced by light or convergence. Upon strong abduction the mydriasis occurs somewhat sooner than when the eye is at rest. If the pupil be in its myotic state this can be interrupted or temporarily abolished by abduction of the globe. Strong adduction exerts an even greater influence, the right pupil being stimulated to contraction prolonging the myotic stage or temporarily interrupting the mydriasis. These impulses affecting the pupil are, however, of temporary effect only, never exceeding a minute, so that after a little time the regular changes recur. Of greater influence than the movement of adduction is the contraction of the orbicularis. When the child is asked to close the lids tightly, but is prevented from doing so by their being held apart,

contraction of the pupil takes place even if it be in the stage of mydriasis. Coincidently with the myosis spasm of the accommodation 2.5 to 3D uniformly occurs, converting a hypermetropia of 4D during mydriasis to a hypermetropia of 1D during myosis. Five similar but not identical cases have been previosuly described. Levinsohn believes nuclear disease to be the cause of this condition.

Paralysis of the Sixth Pair of Cranial Nerves after Rachistovainization.—BLANLUET and CARRON (*Ann. d'oculistique*, 1907, p. 62) report a case of paralysis of the left external rectus muscle occurring a week after the operation, preceded and accompanied by pains in the upper part of the back and neck. They have collated 12 additional cases, 11 of which occurred in Germany. In none of the cases was cocaine used alone. In all but one stovaine was used alone or in combination. In a single case adrenalin was employed alone, and in this, the sole instance of the involvement of both externi, the paralysis has persisted. A unilateral abductor was involved in all the cases except the one just referred to. The pathogenesis of these paralyses is not clear. They have been attributed to an elective toxic action, to a localized hemorrhage, and to a mild meningeal infection.

Pseudoptosis with Hysterical Amblyopia following Injury.—BETTREMIEUX (*La clin. ophtal.*, 1907, No. 9, p. 131) reports a case of apparent ptosis with amblyopia of the right eye after an injury followed by litigation for damages. The ptosis and amblyopia were both hysterical. There was anesthesia of the pharynx and almost complete hemianesthesia of the right side, with areas of norml sensibility. Treatment (electricity, hypnotic suggestion, etc.) being of no avail, operative procedures were proposed, but positively rejected by the patient, who thence began to improve spontaneously. Certain medicolegal questions as to damages are raised by a case like this, and which are not unknown in this country also.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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A Review of Anaphylaxis, with Especial Reference to Immunity.—M. J. ROSENAU and JOHN F. ANDERSON (*Jour. Infect. Dis.*, 1908, v, 85) referring to the important condition of hypersusceptibility or supersensitiveness, state that the condition may be brought

about by the introduction of any strange proteid into the body. Hypersusceptibility to proteins that are non-poisonous in themselves may be readily induced in certain animals. Immunity and hypersusceptibility may co-exist in one animal at the same time. Von Pirquet advises that the term immunity be limited to indicate the condition of complete resistance in which no clinical reaction occurs when poisons (such as diphtheria or tetanus, etc.) are introduced into the organism. He suggests the term "allergie" to indicate the condition of acquired immunity associated with anaphylaxis, such as vaccine against variola, of the luetic against syphilis, or that produced by an attack of acute specific infection. This condition of "allergie" manifests itself in the renewal of the infection in an entirely different manner from the reaction to the primary infection. Tuberculin reaction is a well-known instance of anaphylaxis. This substance is not poisonous when introduced into a healthy individual, but the tuberculous individual is anaphylactic to tuberculin, and so reacts. Horse serum, egg albumin, and milk all give rise to anaphylaxis in the guinea-pig. The cases of eruptions, joint pains, etc., following the injections of horse's serum into the same individual have given rise when aggravated to the term "serum disease." The effect of the repeated doses of horse's serum in guinea-pigs is most interesting, as even a very minute dose may apparently so sensitize the animals that after a "period of incubation" of from ten to twelve days they may develop very serious and even fatal symptoms if the second injection is then given. Rosenau and Anderson give a careful *resume* of the literature on this subject, and have, as a result of many experiments, strengthened their belief that the phenomenon of hypersusceptibility has a practical significance in the prevention and cure of certain infectious processes. It gives a possible explanation of the period of incubation of some of the communicable diseases. As shown in their work, it takes from ten to fourteen days to sensitize animals to a strange proteid. The phenomenon of hypersusceptibility has been produced in guinea-pigs by extracts obtained from various microörganisms; that produced by the colon and typhoid bacillus was followed by a definite immunity to the corresponding infection, but not in case of the anthrax bacillus. They think, then, that we are, therefore, not dealing with a general law applicable to all infections, but with certain limitations, as in the case of antitoxic immunity.

Experimental Cardiac Arrhythmia.—PLETNEW (*Zeit. f. exp. Path. und Therap.*, 1907, iv, 321) used in his experiments on dogs and rabbits three methods for the production of arrhythmic action of the heart: (1) Electrical stimulation of the spinal cord; (2) elevation of the pressure in the peripheral circulation by allowing salt solution to flow into the femoral and subclavian arteries; and (3) clamping of the aorta. By all these methods the intraventricular pressure was increased, as measured by a manometer, and by each method of experimentation irregularities of the heart were produced. The cardiac arrhythmia was brought about by the appearance of extrasystoles. The irregularity of the heart's action was not always proportionate to the increase in elevation of the intraventricular pressure, and therefore was not entirely dependent upon the extra work put upon the heat. If the peripheral

pressure was increased slowly, as occurred in the experiments in which salt solution was forced into the femoral artery, extrasystoles were rarely observed. One of the important factors in producing irregularities appeared to be the rapidity with which the increased pressure was brought about. Sudden clamping of the aorta gave rise to very marked arrhythmia which disappeared after the constriction was removed. In all experiments the reserve force of the individual heart must be taken into account. This varies in different cases. If the obstacle which the heart must overcome does not exceed a certain point, a point which is different for various hearts, the heart has sufficient reserve force to overcome the increased peripheral resistance and the rhythm then remains normal. When the obstruction passes this point the heart's action becomes irregular.

Experimental Tuberculous Cirrhosis of the Liver.—Both French and German investigators have reported, as an accidental finding, cirrhotic changes in the livers of guinea-pigs which had been inoculated with tubercle bacilli, but recently STOERK (*Wien. klin. Woch.*, 1907, xx, 847) has studied systematically the livers from 120 guinea-pigs inoculated with tubercle bacilli, and finds quite constantly definite cirrhotic changes which correspond in a certain way to cirrhosis of the liver in man. In this series of cases the bacilli evidently reached the liver through the portal veins or lymphatics for the earliest changes were found about the intrahepatic branches of the portal vein. These consisted in a proliferation of epithelioid cells and new formation of young connective tissue. At this stage of the process marked proliferation of the liver bile ducts can be seen, with transitions between the bile ducts and columns of liver cells. As the lesions grow older, the picture of a tuberculous infection becomes less characteristic, the proliferation of the portal connective tissue becomes prominent and the new bile duct formation is extensive. Usually the ramifications of the portal vein are narrowed or occluded by the connective-tissue growth and owing to this, foci of necrosis are formed in the liver parenchyma. The necrosis in turn leads to further proliferation of connective tissue. Finally, in the most advanced stages of the process, signs of tuberculous infection have entirely disappeared, and the liver presents an appearance not unlike that seen in portal cirrhosis in man. In contrast to this nodular type of cirrhosis, another form, comparable to the biliary cirrhosis, was met with in which the liver was large and smooth, and showed on section almost complete disappearance of the normal liver cells. The tissue looked as if it were made up of innumerable proliferated bile ducts, about each one of which there was connective tissue. Stoerk is cautious in drawing inferences from these experiments, but thinks that tuberculosis may be numbered among many of the toxic and infectious agents which, reaching the liver by way of the portal vessels, produce cirrhosis of the liver in man.

The Function of the Thyroid and Parathyroid Glands.—Most experimenters who have worked upon the function of the thyroid and parathyroid glands have come to the conclusion that extirpation of the thyroid results in cachexia, while extirpation of the parathyroids is

followed by tetany; but certain authors have reported contradictory findings, while by some it has been thought that after extirpation of the thyroid, the parathyroids may acquire the functions of the larger gland. HAGENBACH (*Mit. aus d. Grenzgeb. der Med. und Chir.*, 1907, xviii, 329) in order to settle some of the disputed points undertook a series of experiments upon cats. He found these animals particularly suitable because of the constancy in the number and position of the parathyroid glands, and because of the marked symptoms following thyroidectomy. In six cats varying in age from three to six months Hagenbach removed the entire thyroid gland together with two parathyroid glandules. Two parathyroids were left intact. The animals developed cachexia, and showed many of the conditions typical of cretinism in man. If animals which had developed this cachexia thyreopriva were subjected to a second operation, and deprived of the two remaining parathyroid glands, they died promptly of tetany.

The experiments thus show that the parathyroids are not capable of functionating in cats for the thyroid gland. The study of the long bones of the cats which developed cachexia after thyroidectomy showed interesting changes. The bones were found to be much shorter than those of the control animal, and occasionally somewhat thicker. The shaft and the marrow presented no striking alterations, but sections made through the epiphyses showed an interesting and typical picture. In the normal bone the process of ossification could be seen in regular and rapid progress, whereas in the bones of the operative animals the ossification looked as if it had been checked, and only in places could signs of retarded activity be found. These changes, together with the alteration in the hair of the cats, the size of the abdomen, and general cachexia were most pronounced in the cats operated on at an early age. Hagenbach concludes that the parathyroids and thyroids are to be distinguished anatomically, embryologically, and physiologically as different organs.

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